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ABSTRACT

A 1-year study determined what students were doing as they engaged in the Chelsea Bank computer software simulation activities. The major goal of the analysis was to build a knowledge base for the development of assessments that would guide instruction and focus teachers and students (in middle-level and high school classrooms) as they used the simulation materials. The primary data source was a set of 22 hours of videotaped classroom activities. In addition, classroom observations; teacher, student, and administrator interviews; and reviews of classroom assignments and projects were used in the analysis. Five major outcomes were achieved the first year: (1) analysis of student/teacher activities as related to the SCANS (Secretary's Commission on Achieving Necessary Skills) competencies; (2) outlining of the structure/format for performance assessments that could be developed to assess program outcomes; (3) analysis of the program impact on the school and classroom curriculum; (4) reporting on the problem-solving competencies emphasized by the program; and (5) analysis of the program components and their impact on learning outcomes. Four key issues cut across all analyses that were conducted: the teacher appeared crucial in developing problem-solving behaviors, collaboration, and the basic skills applied in solving the Chelsea Bank problems; while solving realistic problems, students practiced basic skills; students using the program were able to work together; and the focus of the program was different for different teachers and students. (Contains 25 references, and 17 tables and 13 figures of data.) (RS)

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Cognitive, Social, and Literacy Competencies: The Chelsea Bank Simulation Project

Year One: Final Report

To the Andrew W. Mellon Foundation
and the Russell Sage Foundation

From the Center for Reading and Language Studies
School of Education, Indiana University
August 1996

ED 398 531

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Table of Contents

I. Overview of the First Year Accomplishments 1
What major outcomes were achieved? 1
What major activities were completed? 3

II. Analysis of the *Chelsea Bank* Program Design 5
What is the background and context for the analysis? 5
What were we looking for in the design? 7
What learning objectives does *Chelsea Bank* set out to achieve? 8
To what degree does the program's design support its learning goals? 12
What coaching is provided for the learners? 20
How is reflection supported? 21
Authentic problems promote some development. 23

III. Analysis of the *Chelsea Bank* Simulations' Potential to Develop the SCANS Competencies 26
Were the simulations a viable background for developing the competencies? 26
What methodology was used in the study? 27
The results of the study found that SCANS competencies were in use. 30
What can be concluded then about the program as a vehicle for developing SCANS competencies? 35

IV. Analysis of Problem-Solving Behaviors as a Guide To Developing Assessments 37
What structured our analyses of the program? 37
How was this study grounded? 38
How was the methodology applied? 43
What did we find out about student behavior during the scenarios? 56
How did teacher presence affect student problem-solving behavior? 69
What is the nature of the differences between high school students and junior high students as they do the *Chelsea Bank* scenarios? 72
What are the differences in student behavior between the first *Chelsea Bank* scenario and a later scenario? 75
Four representative segments show the effect of teacher involvement. 79
How clearly is an assessment component needed? 90

V. Teacher-Student Interactions During the Simulations 98
How was the data for this analysis collected? 98
What did we learn about student-teacher interaction? 99

VI. Four Key Issues that Cut Across the Analyses 112
Teacher behavior makes a difference in student behavior. 112
While solving realistic problems, students practice basic skills 112
The students using the *Chelsea Bank* program were able to work together. 113
The focus of the program is different for different teachers and students. 114

VII. Bibliography 116

I. Overview of First Year Accomplishments

This one-year study was conducted to determine what students were doing as they engaged in the *Chelsea Bank* simulation activities. The primary data source was a set of 22 hours of videotaped classroom activities. In addition, classroom observations; teacher, student, and administrator interviews; and reviews of classroom assignments and projects were used in the study.

The major goal of this analysis was to build a knowledge base for the development of assessments that would guide instruction and focus teachers and students as they used the simulation materials. In addition to the development of assessments, the research was designed to understand how the program is functioning in order to make it more effective, particularly in the area of teacher education.

A brief overview of the major outcomes and the activities for the first year summarize the status of the study.

What major outcomes were achieved?

The project planned to achieve five major outcomes during the first year. These outcomes were originally listed in the research proposal and are repeated here so that the reader does not have to look back at the proposal. After each of the five outcomes is a brief statement about what was accomplished regarding the outcome. The complete achievement for each of these outcomes is listed in the body of the report.

1. Analysis of all student/teacher activities as these relate to the SCANS competencies. Additional categories will be added to the SCANS competencies as needed. The analysis will include a discussion of areas of the SCANS competencies which are emphasized and those which are not emphasized.

Status: This analysis has been completed. The results which are included in Section III of the report indicate which categories of the SCANS competencies are emphasized in the *Chelsea Bank* program.

2. Outline of the structure/format for performance assessments that could be developed to assess program outcomes.

Status: An outline for a comprehensive assessment plan has been developed. This plan has been included in the proposal for funding for years two and three. In addition, the results that gave rise to the plan are described in Section IV of the report. The assessments will cover the needs of teachers, students, and those who make decisions about program adoption. Assessments will include both ongoing process assessments and end-of-program product assessments. Specific plans for individual assessments have been developed.

3. Analysis of the program impact on the school and classroom curriculum.

Status: Data were gathered throughout the year. Included were interviews with teachers, administrators, and students. Teacher projects and assignments were also collected. The results of the analysis of the material's impact on schools have been disappointing. This does not mean that the program has not had a significant impact on schools. It does mean that we are not certain of the nature of the impact or of how significant the impact has been. We feel that the classroom curriculum impact question will be answered much more directly after various assessments have been developed and implemented. In addition, the classroom case studies conducted during the second semester (See Section V) provide results regarding this outcome.

4. A report on the problem-solving competencies emphasized by the program.

Status: This outcome has been completed. A quantitative/qualitative analysis of the videotapes, teacher and student interviews, and various *Chelsea Bank* materials has been completed and is reported in Section IV of the report. Much of this information, along with the SCANS analyses will focus the design and objectives of the assessments.

5. An initial analysis of the program components and their impact on learning outcomes. This will be presented in a set of hypotheses as to which aspects of the program are producing which results.

Status: The results of a careful review of the scenarios has been completed and is reported in Section II of the research report. This analysis was completed early in the year and provides an excellent context to study the videotapes. Many of the teacher and student behaviors as they engaged in the simulations are better understood in light of the structure and organization of the scenarios. The analysis of the program components will have a significant impact on the assessments developed in the next two years.

What major activities were completed?

The research project called for three major activities. A fourth activity was added after the research was begun. These are described below along with a brief statement about the status of each.

1. The documentation of evidence of student activity in SCANS categories while the students are engaged in using the *Chelsea Bank* simulation materials. The documentation will also focus on the problem-solving, cognitive, and metacognitive strategies in which students engage. The structure of the categories will emerge as the analysis takes place. However, the SCANS report competencies will serve as the initial guiding structure. Data will be gathered from a) 22 hours of existing videotapes, b) logs of previous observations, c) classroom observations during the coming year, d) interviews with instructors about preparatory work, debriefing activities, and how modules integrate with other class activities.

Status: This activity took most of the time and resources to complete. It involved a careful analysis of the tapes to see what existed, the development of various coding schemes, and the analysis and interpretation of results. The classroom observations, interviews, and teacher assignments and projects were used to expand the data base and to determine the validity of what was observed on the tapes.

2. Gathering of samples of student work throughout the semester and use of this work as a partial basis for developing monitoring guidelines for assessing student growth in SCANS areas. If the student material is of sufficient quality, the guidelines will be used during the first phase to make judgments about the relative degree of student growth in the various SCANS areas.

Status: This activity began slowly because teachers did not submit much material. That was to be expected since submitting the materials was at the teachers' discretion and many were unsure about exactly what they should send. In addition, they were busy learning the procedures for implementing the *Chelsea Bank* simulation program in their classes. Some very useful materials were collected when the teachers were interviewed in their schools. Many possibilities for connections of the *Chelsea Bank* learning objectives to other aspects of the curriculum could be seen in these materials. There was no possibility to use this material as an indication of student growth in the various SCANS areas.

3. Gathering samples of effective lessons, assignments, and projects linked to computer modules. Through interviews with teachers, gather evidence and examples of factors supporting and hindering the development of such effective lessons. This information will, during the second phase, serve as a partial basis for developing research-based guidelines for integrating modules into existing curricula.

Status: This activity was combined with the analysis of the simulation lessons. The artifacts were used to attempt to understand what teachers saw as important outcomes of the *Chelsea Bank* program. That was coupled with the analysis of the scenarios themselves and the teacher and student interviews. These three data sources became the focus of the major analysis of the lessons. The analysis suggested that the importance of teachers in the whole process could not be underestimated. The result of this analysis was a project for the second and third year which would focus on what teachers observe in learning and how they use those observations to further direct learning.

4. It became obvious to the research team that the tapes were not adequate as a source to observe what students are learning over time. While the tapes do cover an entire semester, they do not systematically gather pertinent data. Therefore, the research team developed an additional major activity that was not a part of the original proposal. The activity was to conduct four focused case studies during the 1995-96 academic year. No additional budget was requested for this major activity. However, the Classroom, Inc. staff agreed to assist with it. Without their cooperation and assistance and the cooperation of the site teachers, this longitudinal analysis would not have been possible.

The case studies included videotaping of three scenarios at the beginning, middle, and end of the *Chelsea Bank* program; classroom observations; interviews with teachers and students; and the collection of various artifacts. These case studies were used in the analysis of changes in student behaviors that are reported in Section V. In addition, the case studies provided a rich source of information to examine differences and similarities between the students in the *MindWorks* tapes and those using the program in other schools. Finally, the case studies allowed the researchers to try out data collection procedures that were planned for use in more extensive studies during years two and three.

II. Analysis of the *Chelsea Bank* Program Design

In this section we examine the relationship between the design of the *Chelsea Bank* instructional materials and the learning goals that *Chelsea* is intended to support. Our interest includes the content, the nature of the learning activity, and the support for learning. That is, our goal was to examine the quality of the learning environment in relation to the learning goals.

What is the background and context for the analysis?

Simulations, in general, provide environments very supportive of a learner-centered approach to instruction. There are several features common to simulations that are relevant to this learner centeredness. First, the learner is faced with problems representative of real-world problems, *e.g.*, landing a plane for a pilot or cashing a customer's check for a bank teller. Second, the simulations provide an authentic context for solving the problem. By an "authentic" context, we mean one that has a high degree of cognitive and procedural fidelity with the real-world environment. This means that the learner has the same decision-making responsibilities that would be encountered in the real world and the resources for that decision making are also reflective of the real world. The third characteristic of simulations is that they are simplified in some way—they are not the real world. It is critical that the simplification does not reduce the cognitive and procedural fidelity of the simulation as that fidelity relates to the learning goals. The simplification should be of tasks or cognitive requirements that are irrelevant to the cognitive and procedural demands associated with the learning goals.

In sum, simulation environments are not only learner-centered (the learner is in control); but they are also inquiry-based (the learner is seeking information to make a decision). In current parlance, the *environment*, at least in theory, provides a cognitive apprenticeship for the learner in which specific learning activities are anchored in the larger decision-making requirement.

Simulations are extremely popular for job training in industry and the military (Towne, 1995). They are particularly useful in letting learners practice dangerous tasks (*e.g.*, flying), infrequent tasks such as equipment repair (Lesgold, LaJoie, Bunzo, and Eggan, 1988), and tasks that may extend over months or years in the real world and hence require too much time (*e.g.*, city planning).

While there are many instances of simulations in the world of work, there are very few simulations of workplace or citizenship situations for use in schools. It is not at all clear why this is, since so many of the features of simulations are consistent with the current learner and problem-centered pedagogical focus. It may be that the simulation designers have focused on high-end, complex data models that require computer power not generally available in the schools. It may also be that schools are resistant to the label of *job training;* and it is certainly the case that simulations have been associated with job training.

The Classroom Inc. simulations, which include *Chelsea Bank*, are among the few workplace simulations for use in schools. The software is designed to run on low-end machines, and the instructional philosophy is not to train individuals for a job, but rather to use the job context to teach more general skills.

Our goal is to examine the success of *Chelsea Bank*, from a design perspective. However, as noted previously, we must look beyond simply the fidelity of the workplace representation if we are to assess the learning environment. Workplace simulations, in representing job environments, simply allow the individual to engage in the job activities—to make decisions and to see the consequences of the decisions. While the execution of the decisions (trying to fly the plane) and the feedback on success or failure (crash or not) will lead to some learning, more support is needed to create an effective learning environment. In particular, learning support—*e.g.*, cognitive coaching that is focused on understanding, and support for reflective abstraction of the experience (Schon, 1987; Senge, 1994)—are essential for effective learning. These support activities may reside in the simulation, or they may be provided by a coach outside of the system.

Our thinking about simulation learning environments outlined above led to the development of five criteria for the evaluation of simulation software. We wanted to compare our criteria with those derived from other efforts to evaluate the design of simulations. However, in our search of the literature we found surprisingly little. Indeed, as Jonassen (*in press*) notes, there is very little guidance on how to evaluate any kind of instruction that is aimed at developing problem-solving and decision-making skills in a domain. Reigeluth and Schwartz (1989) provide a strategy for designing and evaluating simulations, but it is from an information-processing perspective that focuses on getting the content into the head. It simply does not attend to the centrality of the decision making (inquiry) in the learning process; nor does it consider the importance of learner ownership in the learning and decision-making process.

In the next two sections we present the five design evaluation criteria we have developed and then describe the learning objectives specified for *Chelsea Bank*. Following that, we look at each design criteria in relation to the objectives for *Chelsea Bank*. Let us emphasize that we see *Chelsea Bank* as a learning environment that extends beyond the software. Thus we examined both the design of the software and the instructions and guidance given to teachers in terms of creating and supporting the full learning environment. Later sections of this report examine the actual implementation of *Chelsea Bank* in the classroom and how teachers have attempted to go beyond the software.

What were we looking for in the design?

Five principles have guided our evaluation of the *Chelsea Bank* design:

1. The problem is authentic.

We are looking for an environment that presents the learner with the kinds of problems real workers in the domain encounter. This includes both the problem as presented and the obstacles or issues that must be resolved in coming to a decision on the problem.

The most common design flaw related to this principle is to oversimplify the problem so that it no longer represents even qualitatively, the kind of thinking called for in the actual environment (*e.g.*, Spiro, Feltovitch, and Coulson, 1992).

2. All learning arises out of working on the problem.

There are two key issues here. First the learner must have ownership of the decision and the decision-making process. Second, all of the learning must arise out of the learners efforts to formulate a decision. The problem is the driving force for the learners' activities. Those activities include everything involved in gathering and evaluating information relevant to decision making. It is in the context of these activities that the learner encounters the concepts and issues and the complex inter-relationships in the domain. In addition to this development of domain knowledge, learners also, and most importantly, learn how to solve problems in the domain and they learn how to learn in the domain.

A frequent design problem related to this principle arises from pre-teaching of concepts that should be learned in the context of the simulation. This pre-teaching reflects a view that simulations are a vehicle for practicing what is learned rather than an environment for learning. Another frequent design problem rests in providing hints as part of the simulation rather than as a coaching tool to be used in response to a learner's request for help. The hints, which are frequently provided to make the simulation more interesting, result in a change in the learning task from one of determining what information is needed and what are logical sources for the information, to one of finding and interpreting the designer's clues. That is, learning is no longer arising out of work on the authentic problem as presented but rather it is organized around the "training" problem.

3. Scaffolding in the environment supports the learning goals.

The value of the simulation environment in comparison to on-the-job experience is considerable: The learner can safely explore the environment without real damage (*e.g.*, crashing a plane); time can be compressed, permitting the learner to efficiently complete a lengthy activity; irrelevant activities or requirements (*e.g.*, "busy work") can be removed permitting more focused time on the central issues; time pressure can be removed allowing more time for thinking and learning, etc.

While this support is generally known as "scaffolding" of the task, we think Carroll's (1990) term "training wheels" is perhaps a better characterization. The goal in providing "training wheels" is that the individual will develop the skills that permit the training wheels to be removed and the learner to perform as a skilled/knowledgeable practitioner.

In considering this variable in design, we must remember that scaffolding or training wheels will remove learning opportunities. For example, if we remove time pressures, the learner may not learn strategies that are effective in a time-pressure situation. If we offer the learners decision options, we take away their requirement to formulate a decision. If we remove particular data relevant to the problem, we lose training the learner to problem solve in an environment with that level of complexity. Thus, it is essential to examine the various sorts of scaffolding in a simulation to determine in what ways they may impact the cognitive demands that are central to the learning goals.

4. Coaching supports the learner in understanding and applying the critical concepts and procedures related to the learning goals.

Coaching may be in the computer system or it may be provided by the teacher or peers. It should be available during the analysis and decision-making process as a learning tool, rather than as a feedback tool after a decision is made. Again, the focus is on understanding (by definition, simulations are aimed at using information in decision making). Hence coaching is not effective if it simply tells the learner what to do next or provides hints as to what to do next.

5. Reflection supports the learning in abstracting, synthesizing, indexing, and extending the learning that occurred in the simulation.

Too often we engage in a project, do a lot of new things, and then never take the time to reflect on what was learned. As a consequence, we walk away with an experience but with little learning. It is absolutely essential that learners engage in reflective activity in which they can abstract or index the experience for future use. That is, the learner should summarize what is learned, identify keys to success, consider where else this new understanding might be applied, etc.

What learning objectives does *Chelsea Bank* set out to achieve?

A large and diverse set of learning objectives are identified in the *Chelsea Bank* materials. In the front matter of the Teachers Guide, fourteen learning objectives are identified. In addition to that listing, there are both general and specific objectives identified for each scenario. A sampling of the *Chelsea Bank* objectives is presented in Table 2.1.

Clearly, the objectives, as stated, are at varying levels of specificity and have considerable overlap. Since learning arises out of the process of coming to a decision, we felt that all the learning objectives associated with the simulation could be organized under the decision-making goals. Therefore, we attempted to organize these objectives by first identifying the decision-making requirements. The *Chelsea Bank* designers identify three areas of decision making that can serve as organizers for the learning objectives: banking practices, interpersonal skills, and ethical practices.

Within each of these decision categories we classify objectives at three levels: understanding the concepts associated with the decision; understanding strategies associated with making a decision; and having the skills necessary to gather and analyze the data needed to make a decision. This matrix of decision category by class of learning objective is shown in Table 2.2. If we examine the objectives identified by the designers of *Chelsea Bank* in Table 2.1, most of the objectives are at the skill level and, for the most part, they are part of making decisions about banking practices. A more detailed consideration of the matrix follows.

Table 2.1 Learning Objectives for Scenarios in *Chelsea Bank* Teachers Guide

General skills and knowledge identified	
In the front matter	**For individual scenarios**
• identify relevant information • apply relevant information • learn and apply rules and procedures • setting priorities • apply math • read for detail • read for comprehension • write at a business level • set aside personal concerns • cooperate • understand banking as a business • understand banking services • understand credit	• banking skills • judgment • computation skills • ethics • interpersonal skills • decision-making skills • attention to detail • comprehension • analytical skills • customer relation skills • problem solving

Numerous objectives relate to banking practices.

Understanding banking practices involves understanding the general purpose of banking, *i.e.*, why people go to banks. It also includes understanding the purpose, from both a customer and a bank perspective, of the variety of transactions represented in the scenarios: check cashing, loans, credit card, deposits, withdrawals. The learners should be able to talk about how they would or could use a bank and they should be able to interpret someone else's description of their banking activity and ask questions about it.

Table 2.1 continued	
Detailed banking objectives	
• decide how to apply bank policy • detect problems that make checks not negotiable • compute money deposits • managing an unpleasant customer • managing an error (ethics) • detecting problems with checks • judgment about potential crime • dealing with bribery • put aside personal feelings • compare information sources • judge whether a person should have an account • calculate income and obligations	• verify customer's identity • determine negotiability of checks • accepting deposits • changing deposit slips • making cash deposits • verify identity of customer • opening a new checking account • conduct an interview to gather information • handling customer complaints • taking a loan application • check credit history

Table 2.2 Strategy for Classifying Learning Objectives

Category of Learning Objectives	***Decisions***		
	Banking Practices	Interpersonal	Ethics
Understand decision concepts			
Understand strategy for decision making			
Skills and knowledge for gathering and evaluating information			

As a bank teller, the learner faces a new "problem" with each customer. While the problems are related—part of a family of problems—each one is different in some way. Thus the learner must develop a general strategy for solving the banking problems. Each problem involves managing information: analyzing the information presented as part of the transaction request and finding and interpreting the banking policy and procedures regarding that request. Hence, what is required is an information-analysis, problem-solving strategy.

If the learners were training to become bank tellers, then the strategy might be a strict procedure very focused on the resources in the bank. However, the goal of the instruction is to develop more transferable problem-solving skills and thus we would want to support the learning and application of a more general strategy, *e.g.*, the IDEAL model developed by Bransford and Stein (1984).

In applying the problem-solving strategy, learners must have the necessary skills and knowledge needed to work with these particular resources. For example, they must be able to attend to detail, comprehend text, write, compute a deposit, compare information resources, etc. A significant number of the Classroom Inc. objectives fall within this category (see Table 2.1).

Interpersonal skills assure a satisfied customer.

In order to develop interpersonal skills appropriate to the situation, learners must understand the concept of customer satisfaction. They must see that a happy customer is one who will continue to do business with the bank—a concern in the service industry. They must also understand that their efforts to satisfy the customer must occur within the constraints of the bank policy.

Simply understanding the need for customer satisfaction is not enough. Rather, what is needed is a framework for achieving customer satisfaction. This framework might come from the study of interpersonal relations, sales strategies, conflict management, attitude formation and change, or a variety of self-help books. In essence, the learner must have a general framework for thinking about types of customer, types of contexts, and what it takes to achieve "satisfaction" with those customers in those contexts.

Finally, learners must have the specific interpersonal skills for implementing a strategy. They must be able to "read" the customer's reaction from both expressions and verbal statements. They must be able to say and act in the ways called for by the strategies that they understand. This skill execution is very much a situated skill, *i.e.*, the learner must be able to respond to moment by moment changes in the customer attitude.

Ethical practices involve recognizing what is fair, right, and within the rules.

The learners need to develop a sense of right and wrong in terms of customers and the bank. They need to be able to interpret a situation and judge what approaches are fair and ethical in terms of treatment of the customer and in terms of their responsibility to the bank. The "rules" for ethical behavior are contained in the banking policy, *e.g.*, the rules state what to do if the customer makes an error in calculating. However, we presume the concern for ethics in the learning goals for *Chelsea Bank* extends beyond the simply following of rules to the development of a sense of respect for "doing the right thing." Thus, while the strategies and tactics for ethical behavior are contained in the banking rules, the broader sense of right and wrong is the focus of this learning objective.

The need to cooperate is dictated by implementation, not design.

In addition to the goals described above, there is a goal of learning how to work with others cooperatively, learning how to negotiate and share decision making. This goal arises from the directions to the teachers to have students work in cooperative groups. Since this is part of the implementation strategy, rather than the design strategy, we will not consider this goal in the design review.

To what degree does the program's design support its learning goals?

We now seek to apply the design evaluation criteria to the *Chelsea Bank* simulation to determine to what degree the design supports the learning goals identified for the simulation. We will consider each criterion in turn.

Is the problem authentic?

Banking Practices. The problems, as presented to the learners, are representative of the range of banking tasks a teller would be expected to do. The service requests by the customers are typical (make a deposit, cash a check, handle a complaint, make a loan, open an account, or issue a credit card). Furthermore the types of problems and the frequency of occurrence of the types seems reasonable and typical.[1] The teller transactions have a wide variety of errors in the materials the customer submits and thus a detailed examination of the materials is required. There is also an occasional need to obtain sign-off from the customer service representative and an occasional need to check balances. The customer service representative opens accounts, issues loans, and resolves complaints. Thus, *Chelsea Bank* receives high marks on this criterion as it relates to the learning goal of banking practices.

Interpersonal skills. In every problem the learner meets a customer with a particular personality representing the range of types of customers that might be encountered in a bank. Thus the presenting problem does address the interpersonal and ethical goals. However, the learner does not encounter the complexities and problems associated with attempting to satisfy a customer. There is only the presenting personality of the customer; there is no interaction with the customer, and hence there is no potential for interpersonal problems to arise. The learner simply responds to the customer following bank policy—with no interaction. The learners do not need to understand interpersonal skills nor do they need to have strategies of specific skills in conducting an interaction.

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[1] An exception to this is Scenario 7 in which a rock star comes to the window and wants to make a deposit. He asks for fast service and slips a $100 tip and an autographed picture into the teller cage. We suspect the authenticity of this scenario is rather low outside of a 90210 context.

It is important to note, however, that presenting customers with interesting personalities is an important strategy—perhaps the primary design strategy—for making the scenarios interesting and giving them an individual character. Thus, there may well be a strong motivational component to providing customers with personality. It is also possible for the teachers to organize activities outside of the scenario whether the students could use these personalities in the study of the concept of customer satisfaction and the strategies for pleasing different types of customers in classroom. However this sort of learning is not supported in the simulation itself.[2]

Ethics. The learners encounter several situations that call for ethical decision making. However, the ethical considerations are not with the strong competing motives associated with real ethical problems (real emotions associated with, *e.g.*, the need for money for my family and the opportunity to pocket part of a customer's deposit without anyone knowing). Indeed, the emotional component of the ethical context is difficult to capture in any instructional environment. But beyond the emotional component, there is no dilemma—it is always simply a matter of following banking rules. Hence the problem solving is not in terms of ethics but in terms of rule following. As with interpersonal skills, the ethical contexts can provide a basis for instruction and discussion outside of the simulation—however, we would expect this learning to be very academic with little transfer to real life.

Does all learning arise out of working on the problem?

One of the key features of *Chelsea Bank* is the lack of instructions to the learners. Nowhere in a scenario are the learners told what to do next, what the functionality of a particular icon is, or how to use the tool represented by the icon.[3] Thus, the learners are responsible for problem solving much as a teller would be on the job. They must decide (recall from initial training, infer from analyzing the problem) what needs to be done or where to go for information on what is to be done. When a step is taken, the learners must decide on the next step (or on whether there is a next step) and how to execute that step. And, as in the real world, if the learners are not sure what to do, they must initiate exploratory activity or ask for advice from peers or the teacher. Some examples:

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[2] We will discuss the Teachers Guide support for teaching interpersonal skills when we look at coaching and reflection.

[3] There are two exceptions. In customer service scenarios, where an application is being made, the application form on the desk is outlined in yellow. In customer service scenarios where there is a complaint, the telephone remains highlighted after it finished ringing. While the telephone highlighting may be necessary (unless the ringing continued until it was answered), it is unclear why the application form is highlighted.

- At the start of a scenario, a customer approaches, places some materials into the window, and states a transaction goal. That is all that happens. The next move is entirely up to the learners—who must come to recognize that they must take the initiative rather than waiting to be told.
- The same application form is used for both new accounts and loans, however only some of the questions are appropriate for new accounts. The questions are not marked "for loan applications only," but rather the learners must learn what questions to ask. (This can be inferred by looking in the manual to see what types of information are required.) If the learner asks a question inappropriate to the transaction, the customer responds angrily.
- It is up to the learners to determine when they are ready to make a decision, and then they must know to follow the path from the computer icon to the "decision" button and then to the decision options. Similarly after a decision is made, there is no system response. The learners must remember that they are responsible for filing a report—the "report" button being one of three other buttons along with the "decision" button.

Clearly, this is learner-centered instruction with learning situated in the learners' work on the problem. There are three exceptions to this, two in the pre-scenario activities presented in the Teachers Guide and the other in the memo given to the learner at the start of the scenario. In the pre-scenario activity, the teacher is directed to teach the students key vocabulary. This pre-teaching removes the responsibility from the learners of monitoring their comprehension of the vocabulary during their work on the scenario—one of the learning goals associated with carrying out the analyses of the banking transaction requests.

The pre-instruction guidance also offers discussion questions for the teacher to present before the scenario. These discussion questions almost always focus on the interpersonal and the ethical issues in the problem. Thus the students can quickly learn to look for those issues when they begin work on the scenario. Their learning of problem finding skills is short circuited.

Finally, when the learner begins a scenario, an office memo raises an issue that is relevant to solving the problem. As with the pre-scenario questions, the memos tend to address interpersonal and ethical issues and this points the students to the key issues in the scenario.

The use of pre-scenario direct instruction reflects a common instructional concern—that the learners must be jump-started on the problem—that they cannot learn adequately in the context of the problem. However, as work with problem-based learning has demonstrated (Savery and Duffy, 1995), learning can successfully occur without pre-training.

With that overview, we now consider the degree to which learning related to each learning objective is situated in the problem.

Banking practices. Each scenario presents a different problem to the learner, and the basic task is to determine the procedure for completing the transaction. In almost all cases, there is little need to understand the banking concepts involved—it is only necessary to determine how to complete the transaction. The exceptions are the scenarios in which the learner must determine if the customer should receive a loan or a credit card. But even in these cases, the learner is only taking the bank perspective—there is little need to understand the value of the card or loan to the customer.

The fact that there are seven bank teller scenarios encourages the learner to develop a problem-solving strategy that will work across scenarios. However, as we will see in the discussion of coaching and reflecting, there is no guidance in developing that strategy or in reflecting on whatever strategy evolved over the course of the seven scenarios. The string of scenarios simply affords the opportunity for learners to develop a problem-solving strategy.

The scenarios are excellent in demanding the skills related to solving the problem. The learners are in control of the problem-solving activity and therefore they must analyze the issues, decide what information is required, and gather that information. There are no additional hints and no feedback on whether the learner is doing it "right." This problem-solving activity requires skills of reading for comprehension and reading for detail, doing basic arithmetic, doing systematic comparisons, etc. In essence, the variety of skills identified by Classroom Inc. as goals for the instruction are called upon in the scenarios.

Interpersonal skills. As noted previously, the pre-scenario discussion and the comment in the memo most often raise the interpersonal issues. Thus there is pre-teaching and focusing on the interpersonal skills and this learning is not situated in the scenario. Rather it reflects a traditional teaching environment.

The scenario itself places little demand on the learner to understand the concept of customer satisfaction. Rather, through the feedback on the scenarios, students learn that the customer will be satisfied if they simply follow bank policy. Since the customer never reacts to the learner, there is no requirement to understand strategies for satisfying customers (beyond following the rules of banking). While the policy manual lists policy in dealing with customers, there is no real need to understand or use those principles.

Finally, since there is no interaction with the customer, the learner cannot practice interpersonal skills.

Ethics. There are only a few cases in the program involving ethics, and the considerations are virtually identical to those for interpersonal skills. The learner is not faced with the emotions associated with an ethical dilemma, and the simple response called for in each ethical case is to follow banking rules. Thus it is banking rules rather than ethics that guides behavior.

Summary and recommendations. The lack of instructions on what to do next does empower the learner in the problem-solving process so that almost all learning is situated in the problem. The exceptions are in the pre-teaching that occurs prior to the scenario or in introducing the scenario: vocabulary training and hints and discussion questions related to interpersonal and ethical issues.

However, situating learning in the problem is but one part of the learning issue. We must also consider what learning is demanded. In reviewing the scenario, we find most of the learning requirements to be in the basic skills involved in evaluating the transaction request, *i.e.*, in the skills related to banking practice. There is little demand for understanding banking practices, for understanding the concept of customer satisfaction, or for interpersonal strategies or skills .

We recommend the introduction of richer problems, problems that extend beyond simply doing a transaction, in order to more fully engage the learner in the banking and customer satisfaction concepts and problem-solving strategies. For example, a scenario may call upon the learner to help the customer select banking options. We also recommend moving the pre-scenario activities to the post scenario or even using them as discussion topics during work on the scenario. Interspersing reflection and discussion during a scenario could lead to a much richer learning environment. For example, the teacher could pause and ask the students to think about what words they did not understand—or which were new words. The goal is to move the discussion to a point after the learners become aware of the relevance of the issue or can see the relevance of the issue through their work on the problem. Finally, the glossary/dictionary in the Policy Manual could be enriched so that the students would have a resource to check meaning when a question arose *within the context of the problem.*

Does the scaffolding support the learning goals?

In comparing the *Chelsea Bank* simulation to the real banking task, we note that the learners obviously operate in a computing environment rather than in the physical banking environment. Beyond this basic characteristic, we can identify four ways in which the tasks associated with the banking, interpersonal, and ethical decision making have been simplified or removed. After examining these four scaffolding strategies, we will examine the impact on achieving each of the learning goals.

Simplified banking tools. A primary scaffolding is in the creation of simplified banking tools: credit reports, account summaries, a banking manual, and an application form. The credit reports and account data are reasonably rich in information and the procedures described in the manual, while task-relevant, are not tied directly to the tasks. Hence inferencing skills are required to apply the procedures. However, while the individual entries are rich, there are a limited number of entries in each resource. For example, there is no credit information on a person unless a credit check is required for the person. And the only person with a detailed credit history is a person having credit problems. Finally, there is no irrelevant information in the manual—each procedure in the manual is relevant to at least one scenario.

The primary impact of this scaffolding is on learning related to banking practices. Most obviously, the complexity of the skills of reading for detail, following procedures, comparing information, calculating, and judging the relevance of information are all reduced. Hence less learning of these skills is expected. Of course the banking tasks had to be simplified. Middle school students ought not be expected to work with the level of complexity that real bank personnel work with. Thus this simplification makes it possible for the students to "enter" the world of banking. However, we question whether there might be too much simplification of the materials. It seems to us that middle school students would be able to work with this level of complexity quite easily. They could work on the problems without being adequately challenged in many of the basic skill and problem-solving areas listed as learning objectives. The only way to determine if this is so is through pretesting, but that pretesting must look at the specific skill demands, not just at the overall ability of the student to complete a scenario. That is, the goal is to fine-tune each of the banking resources so the reading, calculating, judgments, comparing for detail, and other basic skills are adequately challenged in using each resource.

In addition to impacting skill development in the area of banking, we would expect this simplification of resources to also impact the learning of banking concepts. That is, we suspect that a more complex set of banking resources would result in the learners having to make more detailed inferences about the particular banking transaction and therefore in becoming more engaged in understanding the banking concepts. Finally, the simplification also reduces the need for a rich problem-solving heuristic—there is more focus on following procedures to collect data than on determining which information in a particular resource is relevant. Let us emphasize that some simplification of resources is necessary to permit the learner to enter the world of banking, but since these resources are directly involved in the banking practice, the simplification must also reduce the learning opportunity related to banking practices. Hence it is important to fine-tune the resources to ensure that the students are adequately challenged in regards to each relevant learning objective.

We do not see this scaffolding as impacting on the objectives related to interpersonal skills or ethics. If our focus were simply interpersonal skills or ethics, we would want to simplify these materials as much as possible.

Suspension of time. In the real world of banking, decisions must be made quickly and transactions processed smoothly. In the *Chelsea Bank* simulations there is no time factor; students can work on any aspect of a scenario for as long as they want (or the teacher will permit) with no adverse consequences. Removing the time pressure makes it possible for the students to analyze and evaluate the evidence and their problem-solving strategies. It also affords the time for the teacher to coach and pose reflective questions. In essence the removal of time pressure offers the opportunity to study the concepts, develop and evaluate problem-solving strategies, and carefully review and evaluate the data.

This is a scaffolding strategy that can benefit learning in all three areas of decision making. The students can take the time to evaluate the overall task they are involved in and develop a rich understanding of the banking, interpersonal, and ethical concepts that apply as well as develop the strategy for reaching a decision in each area. Since the students do not interact with the customer, the learning of the actual interpersonal skills is not impacted. It is only in relation to learning the concepts and strategies for customer satisfaction that greater learning opportunity is afforded. But, since the students are engaged in basic skills related to banking practices (comparing information, following procedures, etc), greater learning opportunity for developing these skills is afforded by the suspension of time.

It is important to note that we described this scaffolding strategy as simply "affording" the opportunity for more learning. Whether deeper learning occurs depends on the task demands (as determined by the other design features of the simulation, *e.g.*, the complexity of the resources), the coaching, and the reflective questions.

Final decision options. The learners are left in control of their problem solving until a final decision is required; they can review any data in any order up until that point. However, when it is time to make a decision as to how to respond to the customer, they are presented with 3 to 5 decision options. The decision options identify the decision on the banking transaction, the treatment of the customer, and the ethical decision when there is one to be made. What are learners to do if they do not agree with any of the options? The message is, "do all you want on your own, but the decision is not really yours—we will set the parameters for the decision."

As we worked through the scenarios, we found ourselves increasingly going to the decision options early to see the relevant parameters (things mentioned in the decision options) for the problem. Then, forearmed with knowledge of what we can decide and what is important, we returned to examine the customer materials. This was especially true in customer service, where there are no firm procedures and the number of ways of responding to the situation are wide open. For example, in one loan application scenario, a possible decision offered by the system is to award the loan only if the customer is willing to make a larger down payment on the car she wants to buy. This illustrates that there are many ways that a bank could make a loan. Thus learners should be able to think of reasonable options that go well beyond any limited number of alternatives the system might offer.

As we discussed at the outset of this report, we view all learning to be situated in working on the problem—in the case of *Chelsea Bank*, this is coming to a decision on the banking transaction and how to treat the customer. Since the decision making is severely constrained by listing the decision options, this scaffolding strategy has a strong, and in our mind a negative, impact on all learning objectives. The learning requirements are reduced and what is still required is situated in the decision options rather than in completing the transaction—an academic task rather than authentic problem solving.

We strongly believe that this scaffolding should be eliminated—that students must be empowered to make and defend their own decisions. We understand that there is a right answer for the bank teller problems. However, there is no right answer for the interpersonal skills which go across all scenarios and there is no right answer for the customer service representative scenarios. Hence it is important to empower the students to develop and defend their own answers.

We also recognize that teachers and students need feedback on the quality of their answers. However, this sort of feedback can easily be provided in a more authentic way by showing the students how other students have solved the problem and the reaction of banking representatives to these solutions. Thus we recommend that the decision options be eliminated from *Chelsea Bank*. We also recommend that each scenario be pretested with students and that a list of ten or more solutions be selected for use in *Chelsea Bank* as feedback to the students. Then when the scenario is completed, the students can compare their answers to those of other students and infer, based on the commentary associated with those other answers, what a bank supervisor or teller would tell them. This activity would provide a wonderful opportunity for the students to review the banking and customer satisfaction concepts and their problem-solving procedure.

Executing the banking transaction. The focus of the scenarios is on student involvement that begins with the entry of the customer to the point at which learners decide how to respond. The transaction is never carried out by the learners. It is as if the learner examines the case and then tells someone else what to do.

The post decision activity would involve a dialogue with the customer, following procedures, and reading and calculating. Thus the biggest impact of this scaffolding strategy is to eliminate the learning of interpersonal skills—the learner does not have to actually interact with the customer. It also reduces the learning required regarding the customer satisfaction concepts and the development of interpersonal strategies. Since the learner does not have to respond to the customer, there is no need to get very involved in thinking through the concepts or strategies related to customer satisfaction.

In contrast to the interpersonal skill area, this scaffolding increases the opportunities for learning in the area of banking practices. Understanding the banking concepts is situated primarily in coming to a decision related to the transaction rather than in the completion of the transaction. Similarly the richer problem-solving activity arises in that decision-making process—for the most part completing a transaction is by necessity a very specific procedural activity. Finally, while there will be basic skill and information management requirements in completing the transaction, these skill requirements are at least equally represented in the process of coming to a decision. Hence there is little impact on these skills.

In summary, this scaffolding strategy negatively impacts the learning associated with interpersonal skills but increases the learning related to some of the banking activities objectives.

What coaching is provided for the learners?

Fosnot (1989) describes coaching as asking learners questions on the cutting edge of their understanding. Thus the coach is there to challenge and direct the learners thinking on the problem. The coaching is of good learning practices -- not of banking content. The teacher is there not to teach, but to support the development of effective problem solving and learning skills. Thus the coach should ask questions during the learning process about the meaning of terms, the understanding of the concepts, the problem-solving strategy being used, the current status of student thinking on the problem, etc. While the coach may "teach" by telling the students how to do something or the meaning of the term, this is not the focus of the coaching. It is not just helping the students get through the scenario but to aid the students in their learning activities associated with the objectives.

There is no coaching support in the *Chelsea Bank* software. There is no help system built into *Chelsea Bank* to aid the student during the problem-solving activity. There is a requirement to identify the banking principle underlying the decision and to describe the impact of the decision on people, but that happens after decision making and is focused on synthesizing. Therefore we have classified it as reflective activity.

An examination of the Teachers Guide for *Chelsea Bank* indicates that there is also no information for teachers on how to coach the students. The Guide offers advice to the teachers for what they should do before and after a scenario. However, there is no advice in the Teacher's Guide for what the teacher should do during the scenario.

If the learning is challenging to the students, effective coaching is essential. While we think that *Chelsea Bank* affords many opportunities for learning, we thinking coaching is an essential factor in realizing those affordances. Indeed, coaching (and reflection) is essential to achieving the learning goals related to understanding the banking and interpersonal concepts as well as the problem-solving strategies in each of these areas. Since the scenario itself does not make many demands for understanding the concepts or problem-solving strategies these will only be learned through coaching and reflective activities.

What kind of coaching support should be offered? We would argue that there are two types of coaching advice teachers need. First, there is general advice on how to coach; how to interact with the learners as they work. Should they approach the children with a question? Should they wait until called upon? How often should they visit a group and what role should they play? What is the balance between visiting individual groups and talking with the whole class? How much can the work on the scenario be "interrupted"? How should the teacher deal with a student approach that is contrary to what the teacher thinks should be done -- and even what the teacher guide suggests? What are "good" questions to be asking the students? Since this is a very specific learning environment with predetermined events unfolding, it offers a wonderful opportunity to provide concrete examples of very complex teaching concepts.

Guidance on effective coaching strategies is missing not only from the scenario activity but also from the pre and post scenario suggestions. That is, while there are pre and post scenario activities to engage in, there is no overview of what should be accomplished before and after the scenario. For example, why are the vocabulary words identified pre-scenario? The design of the *Chelsea Bank* simulation and the other Classroom Inc. simulations reflect a very specific teaching philosophy -- it would be useful to the teachers to understand how that philosophy might best inform their teaching practices.

The second type of coaching advice is to offer specific advice relative to the learning objectives. We would hope that the coaching would involve developing a general model of problem solving then coaching the children to think about the model. The to-be-avoided coaching in this regard, is giving the students a specific procedure based on *Chelsea Bank* tools and design. That is, the goal is to learn to apply a problem-solving heuristic rather than learning a procedure for *Chelsea*. Similarly, guidance is needed on how to coach basic skill development, understanding bank concepts, and interpreting situations from multiple perspectives (interpersonal skills).

How is reflection supported?

Two types of reflective activity are provided in the *Chelsea Bank* program: a post decision writing activity that is part of the software and teacher directed activities that are outlined in the Teacher Guide.

After the students make a decision they are asked to write reports on the problem, on the banking principle that was the basis for their decision, and on the implications of the decision for the bank, the customer, and themselves as teller/customer service representatives. Consistent with the goal of reflection, the students may leave the reflection (report writing) at any time and return to the decisions or the data in the scenario. The decision itself can be changed at any time up until the reflections are completed and submitted. The ability to change the decision at any time during reflection is an excellent feature, for it is consistent with the purpose of reflecting.

We have identified the report writing as decision related reflection and have noted the value of being able to re-analyze the scenario or change the decision based on this reflective activity. However, that is our inference. Within *Chelsea Bank* it is simply defined as "report writing" which follows the decision. Classroom Inc. should include some guidance on the purpose of the report writing.

In completing the scenarios, we found the report writing took on a bureaucratic flavor – something we had to do simply "because". The questions were not tuned to the issues in the scenario and hence they became too vague and unrelated to the thinking actually done in the scenario.

It is not at all clear how this writing activity relates to the objectives. The questions do not ask about the problem-solving process or the concepts related to interpersonal skills or the banking practice that was the focus of the scenario. In our mind, the questions are too vague to support learning of any of the objectives. The writing activity itself supports the learning objective of writing. However, we are not so sure that this is a good writing activity. If we are to design a writing activity it is essential that the student learn to write to an audience and to focus on the purpose for writing. However, in *Chelsea Bank* there is no purpose nor is there an audience for the writing activity. It is simply being done because the program, and the teacher, say to do it.

The second source of reflective activity, the Teachers Guide, provides discussion topics more specific to the scenario. These reflective activities are described at the end of each scenario under the heading, "After hours: Talking about what happened." The Guide describes the purpose of these sections: " These discussion questions make it possible for students to consolidate and articulate the decisions and issues they dealt with in the simulation." Many of the questions are excellent in doing just that. For example, a question after scenario 4 states: "What skills do you think the teller needed in this scenario? Do you think these skills will come in handy in another kind of business or in life in general?". We would prefer to see the learners stay in their role at this point (e.g., rephrasing the question as, "what skills where most important for you in this scenario?") but aside from that, the question addresses precisely the sort of reflection the learner should be engaging in.

Because we think that the After Hours section is a critical component of the learning environment, we would encourage the designers to continue to refine this section. Some suggestions:

- Be clear to the teachers that this section is not frivolous, but is central to learning. Explain how this activity aids learning.
- Develop more explicit reflective goals to guide the writing of questions for this section. The reflections should center around the concepts and strategies related to the banking activity, the interpersonal skills, and the ethics. For the most part the questions are mostly focused in interpersonal or customer satisfaction concepts and ethics.
- Questions should ask students to reflect on what they did, why they did it, what was important, how they would improve what they did, and where they can use it in the future.

- Many questions in this section actually address the consequences of student decisions. This reflection on decisions could occur in the context of the report writing and hence be a basis for reconsidering the decision. Thus some of the questions (and purpose) of the After Hours section should be considered for integration into the scenario itself. For example, the following question, posed in the Scenario 4 After Hours would be an excellent question to pose to guide the students in evaluating their decision before it is finalized: "What do you think the effect on a company would be if its employees decided it was OK to steal from customers they didn't like?"

Summary and Conclusions: Authentic problems promote some development.

The goal of this analysis was to assess how the design features of the *Chelsea Bank* software and Teachers Guide support the learning objectives. The learning objectives were defined in terms of the areas in which the learner had to make a decision: banking practices, interpersonal relations, and ethics. For each of these three areas, there are objectives related to understanding the key concepts, developing a problem-solving strategy, and developing the skills necessary to implement the strategy. The degree to which the design of *Chelsea Bank* supported these learning objectives was evaluated based on five design features:

- authenticity of the problem
- situatedness of the learning
- scaffolding
- coaching
- reflection

The design analysis indicated that the students are presented with authentic banking problems in terms of the banking activities and types of customers. Furthermore, in analyzing and making a decision in regard to these problem components, the learners are generally in control in investigating and formulating their decision. A positive feature is that there is no scaffolding that guides the learner in the decision making—no suggestions as to how the learner should proceed in the analysis process. There is little pre-teaching of relevant information or hinting as to relevant variables. Thus, with some exceptions, the learner is in control of working on the problem and all of the learning arises out of that experience. These two features, the authenticity of the problems the learners encounter and the fact that the learners work freely, without constraints and generally without pre-teaching, with the banking tools in formulating their decision are the two greatest strengths of *Chelsea Bank*. The students are engaged in an authentic activity of solving banking problems.

A third strong feature of *Chelsea Bank* is the suspension of the time pressure normally associated with completing a bank transaction, permitting students to collaborate, investigate, and evaluate alternative decisions.

While *Chelsea Bank* offers a good problem-solving environment, there is not a particularly great learning requirement. That is, most of the learning is associated with banking practices primarily focusing on basic skills related to determining if a transaction can be completed. More complex materials (bank records, policy manual, etc.) and more complex problems would serve to increase the breadth and depth of learning. The problem types we are thinking of involve helping customers determine what banking service they need or helping a bank teller make a decision on how to treat a customer. In essence, these problems would force the learner to think more critically about banking concepts and strategies for achieving customer satisfaction.

The biggest shortcomings in the design of the software is that the learner is provided with decision options from which a decision must be made, i.e., there is a multiple choice selection for making a decision. This, we suspect, has an impact on the entire learning process in regards to all of the objectives. Once the learners know that they must select from a multiple choice decision, they will quickly realize that they only need to roughly formulate their decision and then use that rough formulation to select among the alternatives. Thus there does not need to be much depth in the analysis of the information or in the weighing and debating of alternatives as to what the banking problem is and how they should respond to the customer.

A second shortcoming in the software design is that the problem ends with decision making--the learner does not follow through with the decision. This has only minor effects on objectives related to banking practices but it basically eliminates the learning associated with interpersonal skills. Since the learner does not have to interact with the customer there is no skill development and, in fact, little demand to develop an understanding of customer satisfaction as a concept. This negative consequence for learning interpersonal skills is augmented by the fact that the solution to the problems is always to ignore the character of the customer and follow banking procedure.

Perhaps most importantly, there is no guidance for the teachers in how to coach students while they work on the problems. Furthermore there is little call for reflection on what has been learned. Reflection is primarily in terms of interpersonal skills. We see coaching and reflection as essential factors in helping the students to develop strategies for satisfying different types of customers and for developing problem-solving heuristics for evaluating banking transactions. We also see coaching and reflection as essential in developing an understanding of banking concepts and the concepts surrounding customer satisfaction.

In sum, we find that the design of *Chelsea Bank* focuses primarily on the learning of procedural skills for completing banking transactions. The most important changes in the redesign of *Chelsea Bank* involves eliminating the decision options and providing guidance to teachers on coaching strategies overall and in relation to the specific learning objectives. Virtually all of the support for learning -- the coaching and the reflection - rests with the teacher rather than the software. We think this is a good feature because it permits discussion of the learners' particular understandings and strategies -- the discussion can be situated in the learners' frameworks for thinking about the problem. Thus, it is essential that the teachers are supported in their coaching and reflective activities.

III. Analysis of the *Chelsea Bank* Simulations' Potential to Develop the SCANS Competencies

The U.S. Departments of Labor and Education suggest that teachers provide more realistic learning experiences to help students make the school-to-work transition. These experiences should model the information-processing, interpersonal, and problem-solving skills called for in the new workplace. The Secretary's Commission on Achieving Necessary Skills (SCANS) (1991) describes several areas in which students should receive extensive experience. Among these are:

- *Resources*—Identifies, organizes, plans, and allocates resources.
- *Interpersonal*—Works with others on teams, teaches others, serves clients, exercises leadership, negotiates, and works with diversity.
- *Information*—Acquires, organizes, interprets, evaluates, and communicates information.
- *Systems*—Understands inter-relationships and can distinguish trends, predict impacts, as well as monitor and correct performance.
- *Technology*—Works with a variety of technologies and can choose appropriate tool for task.

In addition, students should use and develop basic reading, writing, speaking, listening, and computational competencies.

Simulations which involve groups of students in solving realistic workplace problems have the potential for developing SCANS-related skills. *Chelsea Bank* and other Classroom Inc. simulations may particularly lend themselves to this, since the simulations are guided by computer technology, require students to work in teams, and call for the processing of information to solve realistic problems.

This portion of the Indiana University analysis of the *Chelsea Bank* simulations addresses these questions:

1. To what degree do students demonstrate and practice of SCANS competencies while using the *Chelsea Bank* simulations?
2. What roles do teachers and assignments which parallel the scenarios play in fostering the development of SCANS competencies?

Were the simulations a viable background for developing the competencies?

The *Chelsea Bank* simulation places students in the roles of bank branch teller and customer service representative. In performing in this role, students appear to be provided significant opportunities to use SCANS competencies. For example, students are confronted with customers who are pressed for time and are sometimes confused. Some expect certain treatment because they are the teller's friend or expect to be recognized. The students must make decisions about cashing checks, making initial loan recommendations, and providing appropriate bank services. This requires asking questions of customers, trying to discern accurate information from their life-like answers, which sometimes wander and are occasionally evasive. Success usually requires using the computer for looking up credit records, examining the bank procedure manual, and perhaps asking further questions. Before decisions can be made, students must discuss and evaluate conflicting information with other students in the group. Final decisions about what to do are followed by typing into the computer reflections about each decision's impact upon the customer, the bank, and the person making the decision. If a student group successfully resolves a sufficient number of teller window problems, its members are promoted to deal with more complex customer service problems.

A common pattern is for teachers to integrate simulations into a semester class plan. One or two days a week, students work in groups with the computers. Other days involve work with related assignments, such as scripting and shooting a video commercial or writing the dialogue and background information for potential new problem-solving scenarios which teach and reinforce the curricular goals of an English class, social studies class, mathematics class. In still other classes using *Chelsea Bank*, students have worked on teams to compose directions and tips for new employees which they present in the form of manuals and computer-constructed signs. A group of students in an economics class participated in a parallel "plan a business" activity which involved interviewing neighborhood business people, learning about business plans and loan requirements, developing a business plan, and presenting the plan to the class.

Homework and non-computer days are sometimes focused upon learning concepts related to the simulations and parallel assignments such as those described above. After computer activity days, classroom discussions sometimes link to other class assignments. For example, in one computer simulation, many students mistakenly refuse to cash the check of a poorly dressed, smelly individual who actually has an account at the bank. In one teacher's class, this led to a next-day discussion of stereotypes and the need to check information. Throughout the semester, this classroom discussion served as the basis for several other more traditional activities revolving around evidence and support for judgments.

What methodology was used in the study?

A team of researchers at Indiana University have been examining student and teacher use of the *Chelsea Bank* simulation in terms of the role the simulation plays in developing SCANS competencies. We have interviewed students and teachers, observed classroom activity, gathered samples of classroom and homework assignments, and carefully analyzed videotapes of students using the computer scenarios. In this section of the analysis, two questions are addressed:

1. To what degree do students demonstrate practice of SCANS competencies while using the *Chelsea Bank* simulations?
2. What roles do teachers and assignments which parallel the scenarios play in fostering the development of SCANS competencies?

Numerous students and teachers were observed on videotape and interviewed as subjects. Data for this analysis come from:

1. Videotapes produced by *MindWorks*, Inc. of students using the *Chelsea Bank* scenarios at two schools during the 1994-1995 school year and videotapes of student groups using *Chelsea Bank* scenarios at four schools during the second semester of 1995-1996; and
2. Interviews performed by the researchers with students and teachers who have used the *Chelsea Bank* scenarios.

The students and teachers observed and interviewed came from eight different schools using the *Chelsea Bank* simulation. At some schools there was extensive videotaping of students working through the scenarios, and at all schools both students and teachers were interviewed. Some of these interviews were performed while on site and others were part of a pattern of on-going telephone interviews with instructors.

A detailed analysis of the presence of activity related to SCANS competencies was performed using the videotaped activities of students who had been recorded while using the *Chelsea Bank* scenarios at a high school and a middle school in New York City during 1995. From 22 hours of raw video footage produced by *MindWorks* videos, we selected those sequences in which the students were meeting a scenario for the first time. Much of the video included staged shots in which students were asked to re-enact their responses to the videos so that multiple camera angles could be gathered. None of these shots were included in the SCANS analysis. Other unused shots included teacher set-up lectures and attempts to get classes settled. Five hours of the original 22 hours was judged to be useful for analysis. Nearly all of this five hours is accounted for by 14 sequences showing 13 different student groups.

Video sequences of students and teachers from four other schools (recorded during 1996) have been analyzed less formally, with an emphasis on the teacher's role during scenario activities. In addition, these teachers have been interviewed about their roles, about student progress and reactions to the scenarios, as well as other class activities relating to the simulation. At each of these four schools, several students have also been interviewed about their reactions to using the scenarios, what they have learned, and how they have applied that learning in and out of school. These students range from middle school to upper high school level.

The videotaped segments were carefully coded using a variety of instruments.

Special tools were developed to record the data basic to the study:

SCANS Coding Forms. The detailed SCANS analysis of the *MindWorks* tapes was conducted using a coding protocol that looked at each minute of scenario activity and rated the time spent on every category of SCANS competency and basic skill—Resources, Interpersonal (student/student), Interpersonal (teacher/student), Information (acquire/organize), Information (interpret/evaluate), Information (communicate), Systems (predict/understand), Systems (monitor/correct,) Reading, Writing, Math, and Oral. For each minute, the scoring was on a *0-2* scale, where less than 20 seconds was scored *0*, 20-39 seconds was scored *1*, and 40-60 seconds was scored *2*. In addition, any isolated occurrence of a competency (usually allocating Resources or noting relationships within Systems) was noted and counted.

Two researchers coded all of the sequences independently (and achieved 85% inter-rater agreement). They then discussed any discrepancies and reconciled them, either from notes taken during their separate viewing or by viewing together the relevant minutes again.

Teacher Interviewer Forms. The interview forms used for teachers asked questions about how well the simulation had succeeded in their classes, what they thought students were learning, what other activities they were doing in connection with *Chelsea Bank*, and possible transfer of learning to other classes and outside school. In addition to structured interview forms, some teachers participated in on-going telephone interviews about their judgments of student progress and the sorts of parallel in-class activities they developed in conjunction with the *Chelsea Bank* scenarios.

Student Interviewer Forms. The interview forms used for students asked questions about their enjoyment of the scenarios, what they were learning, other class activities, and possible transfer of learning to other classes and outside school. These interviews were all conducted on-site by researchers.

The data analysis revealed when SCANS categories were being practiced.

SCANS data analyses mainly produced simple percentage and occurrence reports of the degree to which student activity is observed in relation to SCANS categories and in some cases subcategories. Definitions of these categories and sub-categories are found in the results explanation of this section. Since students performed quite differently when teachers were interacting with groups, data are also reported in "teacher present" and "teacher absent" breakdown. No one student group was videotaped by *MindWorks* during early, middle, and late scenario use, so it was not possible to legitimately track student growth in SCANS usage as their scenario experience increased. Some very cautious hypotheses about student growth were be made, however, comparing SCANS results of student groups videotaped during early scenarios with SCANS results of students videotaped during later scenarios.

Teacher and student interviews were not designed to directly address SCANS use, but rather to gather a sense of reaction to the scenarios. It is possible, however, to find several examples from teacher and student comments which reveal transfer of learning to SCANS-like activities at home, at work, and in other classes. In addition, teacher interviews and observation of teacher-developed parallel assignments also occasionally reveal examples of SCANS-related activities. Examples gathered from these interviews and observations are informal and serve to corroborate and elaborate upon conclusions drawn from the more systematic SCANS analysis rather than stand on their own as a separate, structured analysis.

The results of the study found that SCANS competencies were in use.

The results of the analysis of the data provided highly informative answers to our two major questions:

To what degree do students demonstrate practice of SCANS competencies while using the *Chelsea Bank* simulations?

The answer to this question was derived both from the interviews and from the viewing of the videotapes.

Student Interviews: After using the *Chelsea Bank* scenarios for a semester at John Jay High School, 15 students were interviewed about their reactions to the scenarios. Students were asked a question which addressed transfer of learning beyond the computer activities to other classes and out-of-school situations. Nearly two-thirds of students offered examples of transfer. When examples were linked to other school classes, they tended to relate to group work (*e.g.*, speaking up more during group-work, using turn-taking and consensus building approaches).

This relates to the Interpersonal areas of SCANS competencies. Negotiation is one subcategory mentioned in this area. Some of the high school students also mentioned directly learning some of these skills within simulations. Learning how to work with customers is the example most often mentioned:

- "You learn how to treat people. If you can't relate to other people, you can't work anywhere. You have to avoid discrimination."
- "I learned to separate my feelings from the job rules."
- "It helped us understand how to control our tempers, calm the customer down, and investigate the problem."

Some students reported having more sympathy for clerks and bank tellers who need to request ID and have to follow specific procedures. Other students reported using information-gathering strategies and evidence-based decision making during discussions with their parents.

One young lady reported having fewer arguments with parents as a result. A young man described using newly learned group leadership and problem-solving skills when working with other youth in the Guardian Angels neighborhood protection organization of which he was a member.

When asked how they had learned to do the transfer activities they described, some students mentioned working out procedures on their own while in *Chelsea* groups. Other students mentioned direct instruction, modeling, and reminders from their teacher during non-computer time. This sometimes occurred during next-day debriefing sessions. One teacher was reported to practice what he preached in showing students how to survey everyone for opinions, accept answers without criticizing, and check for consensus.

Evidence of SCANS competencies on MindWorks videotapes. Videotapes of 13 groups of students using *Chelsea Bank* scenarios have been examined for evidence of students employing skills in the various SCANS competency areas (*i.e.*, Resources, Interpersonal, Information, Systems, and Technology). The percentages of time are given for 283 minutes of videotaped student activity (171 minutes when a teacher is not with the group and 112 minutes when a teacher is present). This division is chosen because the students' activities changed markedly when teachers were present. (Because more than one category is usually applicable to any activity, the percentages in any column add up to considerably more than 100%.)

Table 3.1 Student SCANS Activities While Using *Chelsea Bank*

Category	*All*	*Teacher Absent*	*Teacher Present*
Resources	38 times	25 times	13 times
Interpersonal (student/student)	42%	56%	21%
Interpersonal (teacher/student)	15%	NA	37%
Information: (acquire/organize)	48%	52%	42%
Information: (interpret/evaluate)	29%	24%	37%
Information: communicate	18%	21%	13%
Systems: (predict/understand)	23%	20%	26%
Systems: (monitor/predict)	26 times	19 times	7 times
Reading	33%	39%	22%
Writing	20%	23%	14%
Mathematics	6%	8%	3%
Oral	81%	79%	84%

In order to explain the meaning of each of the categories, they are described below with examples of the types of activities that occur in *Chelsea Bank* videotaped activity.

- *Resources*—identifies, organizes, plans and allocates resources:

  ...choosing to consult the on-screen manual, memo, or accounts.

- *Interpersonal*—works with others on teams, teaches others, serves clients, exercises leadership, negotiates, works with diversity:

  ...students discussing their decision choices, working together to count cash, and cooperating as they write about the effects of a decision (more passive events, such as one student reading aloud, are not included); teacher discussing the problem with a group.

- *Information*— acquires, organizes, interprets, evaluates, and communicates information:
  - acquires/organizes—*students reading the start of a scenario, listening to questions from the teacher, consulting the manual, and counting cash*;
  - interprets/evaluates—*selecting from among the decision choices and discussing the effects of a decision;*
  - communicates—*writing reports on the problem, the effects on bank, teller and customer, and the rules for good banking.*

- *Systems*— understands complex inter-relationships, can distinguish trends, predicts impacts, monitors and corrects performance:

  ...extended discussions about the impact of decisions and understanding the relationship between the bank, the teller/CSR and the customer;

  ...brief examples of monitoring and correcting of spelling or pronunciation, or where to find information in the manual.

- *Reading*

  ...the start of a scenario, the materials presented to the teller by a customer, the manual and decision options.

- *Writing*

  ...typing reports on the problem, the effects on bank, teller and customer, and the rules for good banking.

- *Math*

  ...counting cash.

- *Oral*

  ...reading aloud, discussing decisions, listening to teacher.

Observations on Videotape SCANS Results. The analysis of the videotapes provides the data for some interesting observations.

- The students (and sometimes teacher) are speaking and listening for 81% of the time, and are engaged in interpersonal interactions for 57% of the time.

- Processing of information takes place 95% of the time: 48% in acquiring/organizing information, 29% in interpreting/evaluating it, and 18% in communicating information.
- Systems activities (*i.e.,* determining cause and effects) take place 23% of the time, Systems incidents take place 26 times, and incidents related to Resources take place 38 times.
- Reading occurs for 33% of the time, Writing for 20% of the time, and Math for 6% of the time. Both reading and writing occur less often in the presence of the teacher: reading decreases from 39% to 22% and writing from 23% to 14%.

Tentative Hypotheses about Student Growth. Comparisons can be made of students in early scenarios (1-4) with other students in middle scenarios (5-8) and later scenarios (9-15).

- In the absence of a teacher, the oral ratings for the student groups increase from 63% in early scenarios to 85% in middle and later ones. This is close to the maximum possible, given that a certain amount of time is spent reading or writing with little group interaction. Students are learning to discuss at greater length and in more detail. This increase does not occur when the teacher is present and activity tends to be more teacher-led. Further discussion of this follows below.
- Ratings of student reading increase from 27% in early scenarios to 45% in middle and later ones. Students are using reading to search for information and to help evaluate earlier information. This increase does not occur when the teacher is present and students tend to look to the teacher for answers.

Conclusions about student growth must be very tentative since it was not possible to track a single set of students all the way through the scenarios. The general trend of increased SCANS activity is, however, encouraging and merits more careful examination with systematically videotaped student groups.

It is clear that students using the scenarios in the *MindWorks* videos employ and practice SCANS problem-solving competencies a good deal. This is confirmed by student interviews which identify applications beyond the computer activities and acknowledge the roles played by both the scenarios and teacher direction in producing learning. *Chelsea Bank* activities viewed in the videos require more active student involvement with SCANS competencies than do more traditional listen-to-lecture, read-the-chapter, and answer-end-of-chapter question activities.

What roles do teachers and assignments which parallel the scenarios play in fostering the development of SCANS competencies?

The role that teachers play in shaping the *Chelsea Bank* experience while students are using the computer programs appears to be very important. There does not, however, appear to be a clear pattern for how teachers interact with students. The tentative conclusions below are drawn from careful analysis of the extensive videotaped interventions of two teachers on the *MindWorks* tapes and, to a lesser extent, from videotapes of four teachers who used the *Chelsea Bank* scenarios during Spring of 1996.

Data from the SCANS analysis of the *MindWorks* tapes indicates that students are more likely to interpret and evaluate information when teachers are present (37%) then when alone (24%). In actual fact, this higher interpreting/evaluating result is due mainly to the persistent urging of one videotaped teacher for students to ask evaluative questions. The second teacher intervened to ask more factual level questions and students actually did more evaluation when she was not present than when she was. *This difference between teachers and the subsequent difference in student performances are very important.*

The four additional teachers who appear on more recent videotapes seem to differ as much from the two *MindWorks* teachers as these two teachers differ from each other in terms of their relationships to students doing the scenarios. Three of the additional four teachers appear to only intervene in student discussions when summoned by students. Interactions and feedback tend to be directive. For example, teachers tell students step-by-step how to solve a computer problem, or in some cases they direct students on how to solve scenario problems. Neither evaluative nor factual level questions appear to be much in evidence. Only one of these four teachers is videotaped initiating interaction between himself and his student teams while they worked on computer scenarios. This teacher frequently approached a group, listened to the group members' discussions and observed their progress for a few moments, and then offered unsolicited guidance and advice to the team.

Student interviews. As described earlier, several students were interviewed about their evaluations of the *Chelsea Bank* experience. When describing memorable recollections, several mentioned parallel assignments, such as scripting and producing videotaped commercials based upon bank services or scenarios. When probed to explain how they had learned to transfer what they had learned beyond the class using *Chelsea Bank*, some students gave credit to direct guidance from their teacher during regular government class meetings. The teacher was reported to describe and model ways to survey all group members, avoid criticism, and give all group members credit for what they did. Out-of-school transfer examples were more diverse.

Teacher interviews and observations. Interviews with teachers revealed a wealth of activities which had been developed to parallel the *Chelsea Bank* scenarios. Among these were: 1) scripting and shooting a video commercial; 2) writing dialogue and background information for potential new problem-solving scenarios; 3) composing directions and tips for new employees in the form of manuals and computer constructed signs; 4) planning a business by interviewing neighborhood business people, learning about business plans and loan requirements, and developing and presenting a business plan; 5) working in class on banking activities like: accepting checks, writing checks, using deposit and withdrawal forms, bank balance recording sheets, and reconciling statements; 6) writing advertisements and job ads for teller supervisor and other positions; 7) visiting a local regional Reserve Bank where students saw money being shredded, understood explanations of Reserve Bank activities, and asked relevant questions.

Teacher interviews also revealed strikingly different conceptions about what students were to be learning and how they were to go about it. Some teachers described the scenarios as useful activities in their own right which would somehow teach students about the real world. The role of the teacher was seen as keeping students on task and giving them needed boosts to help them get through the scenarios in the class time available. Help was provided when solicited or when students appeared to be in difficulty. Other teachers saw the scenarios as another venue to practice the social and group dynamics lessons being taught as part of classroom goals. Modeling, direct instruction, and reflection were natural parts of all activities.

Still other teachers saw their role as being deliberately hands-off so students didn't become too dependent. These teachers provided very little interaction in most scenarios, confining themselves to answering student questions in order to set them moving again. Still other teachers saw themselves as providing the necessary mental stepping stones for students to think correctly about how to solve the problems. One teacher, for example, was observed describing the scenario in detail before students started (even saying, "And maybe he's made an error in counting the money.") His comments during scenario tended to keep students moving through the activity more than thinking about issues.

What can be concluded then about the program as a vehicle for developing SCANS competencies?

Videotape data from this study demonstrate wide-spread student use of SCANS competencies when learning with *Chelsea Bank* scenarios. Interview data from students and teachers corroborate transfer of these learned competencies from the scenarios to use in other classes, at home, and at work. Though the videotape coding system is capable of tracking some indices of quality (*i.e.,* various levels of processing information and use of Systems), for the most part the SCANS video analysis data is not a good indicator of the *quality* of student competency use. For example, the system is not currently capable of discerning improvements in reading abilities or changes in the quality of interpersonal interactions. It only tracks, in accurate detail, the fact that reading and interpersonal activity are occurring. In some cases, for example, reading involves students struggling to make sense of a single word and in other cases students are using several sophisticated strategies to read from multiple sources. Forty seconds of either activity are counted equally.

Interview data provide examples of high quality transfer of SCANS learning for some students and help add detail to the picture of what occurs when students learn with *Chelsea Bank*.

This interview data, however, is not systematically gathered from a cross section of students and teachers and cannot allow us to draw solid conclusions about general impact. Teacher observation/rating scales (based on video data gathered during the first year of this study) are being developed to better track the quality and improvement of student SCANS competency use.

Teachers have been able to develop a wide range of assignments which parallel *Chelsea Bank* scenarios and appear very likely to extend and expand student use of SCANS competencies. These assignments are imaginative, challenging, often draw upon real-world resources, and build bridges to the classes with which *Chelsea Bank* is integrated. Other teachers using *Chelsea Bank* could benefit from a systematically gathered and organized collection of the best of these activities.

Although all teachers received essentially the same preparation for using the scenarios, the video data, interview data, and classroom observations all indicate significant teacher differences in impact upon students. Further, teacher understanding of what their roles ought to be also differ considerably—*and these differences appear to be important.* When some teachers intervene with students, the quality of student information processing consistently rises while with other teachers information processing consistently declines to a more factual level of following directions. Some teachers perceive their roles to include modeling and guiding students. They use probe questions, explicit instruction in how to function in groups, and model during regular classes the methods by which students should respectfully survey each other for information and reach consensus to solve problems. Other teachers see themselves as needing to take a more "hands-off" role except in removing obstacles which inhibit students from using the scenarios. Still other teachers seem to see their role to be that of "hint giver" or "encourager" or "technician."

Each of these roles may be important and necessary, but it seems clear that student growth in particular SCANS areas (*i.e.*, information processing, interpersonal functioning, understanding systems, etc.) is strongly related to appropriate and effective teacher use of these roles. For this reason, it is very important to study further ways that teachers perceive their roles in relation to *Chelsea Bank* and the development of the SCANS competencies. Since teacher interventions (during scenario use and in developing parallel activities) appear to make so much difference, it is also important to examine and develop methods for expanding and supporting effective teacher activity when using *Chelsea Bank* and other Classroom Inc. programs.

IV. Analysis of Problem-Solving Behaviors as a Guide To Developing Assessments

The year-one study focused first on the SCANS competencies as outlined in the U. S. Department of Labor *Secretary's Commission on Achieving Necessary Skills* (SCANS) (1991). This analysis (see Section III) was important in order to understand whether the lessons were developing the competencies described in that report; however, the researchers felt that those competencies were not detailed enough. It was necessary to define them more clearly as problem-solving behaviors that could be evaluated with the assessments that were to be developed.

What structured our analyses of the program?

Readers' cognitive and metacognitive strategies had been identified by the researchers in previous studies. These studies resulted in a list of "thinking" or "problem-solving" strategies that readers engaged in as they constructed meaning. In many ways the list of reading strategies resembled the typical set of problem-solving strategies that have been described in the research and theoretical literature; and it was, therefore, modified to more directly reflect that background. This modified list was then used in initial analyses of students using the *Chelsea Bank* simulations, and it evolved further as data was collected from viewing the videotapes.

Thus, as we analyzed the behaviors of those using the program, their performance was helping to structure the refinement of the categories for the assessment to be developed in years two and three. The students' problem-solving strategies and the teacher behaviors that seemed to be influencing student performance became an important focus of this phase of the study—as were several key strategies that experience and the literature endorsed even though they were not prevalent on the tapes. The procedures used in the study are discussed in this section of the report with a description of how the videotapes were segmented for analysis. The categories are then defined, the reliability of the ratings using them is presented, and the findings based on them are reported.

The intensive analysis of problem solving had a very practical objective: It underlined and helped articulate the need for an assessment component in the program, and *the understanding and description of student behavior which grew out of the study will be used as a basis for developing student assessments.* At the same time, it should guide the teacher's use of the program—a need underlined by a key observation about the influence of teacher presence. This observation is discussed following the findings based on major categories and problem-solving strategies. Also, other aspects of student behavior were analyzed and are discussed in a comparison of grade levels and a consideration of the impact of particular scenarios and their sequencing. A more detailed discussion of the students' use of the categories and strategies examined follows with a description of four segments on the videotapes.

As the report will demonstrate, the study rationalized the aims proposed for years 2 and 3 of the study. The need for an effective assessment component for the *Chelsea Bank* program is discussed as a background for the concluding sections of this report, which detail this study's impact on the approach and design that will be used to build the assessment component.

The study has clearly defined objectives for the assessment. Included in these is the goal of developing assessments that will focus learning, that will meet goals dictated by several major categories that have guided our analyses, that will develop the problem-solving strategies the study has verified as important student behavior, and that will help students and teachers make more effective use of the *Chelsea Bank* simulations. Hopefully, too, in helping the use of the program to flourish, the assessment component can contribute to it as an impetus to school reform.

How was this study grounded?

This phase of the study began with a look at four general categories that had been emphasized and described by program developers at Classroom, Inc. These seemed implicit foci for the program and provided a first cut for the analysis before the researchers moved to a more specific analysis of students' problem-solving strategies.

The description of these four general categories was somewhat redundant of the SCANS analysis that is reported elsewhere in this report. This redundancy was planned and helped to provide a validity check for the two analyses. However, this phase of the study used these four general categories only as a starting point for further analysis. In addition, this phase did not look at all of the SCANS competencies as was done in the study reported in Section III.

These four general categories included the focus on basic communication and mathematics as a major category labeled *Use of Basic Skills.* A second major emphasis was on *Problem Solving* as a focus on attempting to solve—to reach a solution to—a posed problem. A third general category was *Collaboration*, which might better have been called "group work." It did not attempt to analyze whether students actually collaborated in arriving at a solution or understanding a problem. Rather, at this general stage, the question was whether students were working together cooperatively to complete a task. The fourth general category examined was whether the students were developing competence in the *Use of Banking Concepts*.

The literature links problem solving and critical thinking.

The reading strategies identified in previous studies by Farr and Greene were used beyond the starting point just described in developing the initial list of strategies to be examined in the videotapes. This list of strategies had been analyzed in relation to similar studies reported in the literature. The literature on problem solving and critical thinking is extensive and cannot be reviewed in this paper. However, a consideration of a few of the major examinations of problem-solving theory and of critical thinking analyses will demonstrate some of the influences on the final list of problem-solving strategies that were used in this study.

Critical thinking is often linked directly to decision making, so that the two become interwoven and frequently synonymous. The influential work of Norris and Ennis (1989) makes this connection with five steps involved in critical thinking:

1. Clarify the issue by asking critical questions,
2. Gather critical information about the issue,
3. Begin to reason through the various points of view,
4. Gather further clarifying information and conduct further analysis as needed, and
5. Make and communicate the decision.

The eight strategies that were identified by this study for the viewing and analysis of the videotapes rely heavily on this sequential description of what is, in effect, issue resolution or problem solving. In order to conduct this kind of rational behavior, the student using the *Chelsea Bank* program must focus on the problem (step 1) and rely on previous specific and general learning (step 2). Steps 2 , 3, and 4 of the Norris-Ennis model also relate to recognizing when one is confused, seeking help for clarification, and making changes in one's thinking—one's assumptions, predictions, and options for resolution. These activities, which were strategies identified in this study, are also relevant to steps 3 and 4 above, as is another key strategy identified by our study: collaboration in solving the problem. That strategy is also related to Norris and Ennis' last step, as is our general category of collaboration.

This kind of overlapping and interlacing is not uncommon when one begins comparing different theoretical descriptions of critical thinking and problem solving, and it is equally prevalent across models based on the same seminal thinking, such as that of Norris and Ennis. The descriptions and categorical schemes that are developed in different studies to fit particular learning environments echo the *operational*, *process-relevant* emphases in Norris and Ennis.

Like the many applications of the SCANS competencies, categorical schemes and analysis designs take the general descriptions and modify them in applying them to specific situations—as we have done in studying the *Chelsea Bank* program.

Another example of the kind of work that provided background for our analysis is that of Marzano (1992). In particular applications, this model has been described with many more facets, but it is built on five key *dimensions*:

1. Positive attitudes and perceptions about learning,
2. Acquiring and integrating knowledge,
3. Extending and refining knowledge,
4. Using knowledge meaningfully, and
5. Productive habits of mind.

The similarity of Marzano's second and third dimensions to steps 1, 2, 3, and 4 of the Norris-Ennis general model is obvious. They are also compatible with the processing strategies used in our study. Clearly the need to focus on a problem while using previous learning, seeking help, recognizing confusion or the need for clarification, and making changes cross all of Marzano's dimensions, particularly numbers 2 and 3. Dimension 4 is a general classification that includes the prediction-making, inference-drawing strategy that we have valued highly as a problem-solving behavior. As Marzano details them, dimensions 1 and 5 cover our concern with being focused, the value that the *Chelsea Bank* program places on collaboration, and the strategies of recognizing confusion, getting help, and making changes. While these behaviors—like revision of one's thinking and expression in writing—are not often prevalent in the student behavior viewed, they are, we have concluded, endorsed by many of the foundational descriptions of problem solving.

The highly useful Marzano model exemplifies another characteristic frequently found in theoretical models of thinking processes: Its first and last dimensions are, from a logical perspective, not viewed from the same perspective as the other three. Although dimension 5 is detailed with some specific recommendations, it appears more attitude-relevant than strategic, like steps 2-4. What brings the dimensions together is that they are all broadly scoped goals for students who are thinking critically in order to solve problems; thus they are, like the Norris-Ennis model and the 12 categories used in this study, a reasonably operational attempt to describe the behavior.

Typical of the process-oriented descriptions that ensue from such models is one by Fogarty and Opeka (1988), which includes active listening, articulation, cooperation, questioning, organizing and analyzing data, comparing, contrasting, classifying, and creative strategies such as brainstorming, visualizing, personifying, inferring, and using analogies.

Numerous strategies like Fogarty and Opeka's and one relating problem solving directly to mathematics (Sackett, 1994) are more common than short lists. Sackett says that sensitivity, cooperation, and collaboration are needed to solve mathematical problems. The competencies he lists are communications skills—reading, writing, and speaking; learning skills, including use of information; and critical thinking skills like the analysis of facts. Yet in a summary of critical thinking skills, Potts (1994) presents only three general strategies, one of them the traditional inductive behavior of forming categories, one the ability to find or identify problems, and one "enhancing the environment." The latter seems more directed to the teacher, but it does stress the attitudinal factors present in other models.

The methodology begins with a belief in metacognition.

The methodology used in this study assumes that the students using the *Chelsea Bank* program have some metacognitive sense how they are processing the information presented in the scenarios and how they are coming to a decision that is a solution to the problem presented in each simulation. Developing metacognition in students has become a major emphasis in the theory-making and research on learning and thinking. A keystone in the metacognitive literature is the work of Flavell (1979), who found only limited ability in very young children and more as the age of his subjects increased. This suggests that metacognitive processes are learned.

Many researchers have pursued the delineation of metacognitive strategies among children and have considered ways of developing them. Barell (1995) includes a chapter on developing metacognition in an extensive book on strategies for teaching thinking. Like Barell, Fogarty (1994) believes that metacognition involves not just awareness of one's own thinking behaviors and strategies, but control of them as well. With James Bellanca, Fogarty (1991) links the development of metacognition directly to cooperative team learning. Krulik and Rudnick (1994) promote metacognition as a means of self evaluation.

The observational methodology profits from verbal protocol analysis.

Depending on the metacognitive process, and assuming that it will operate within the *Chelsea Bank* program, the methodology of our study is grounded also in *verbal protocol analysis*. This research technique is most often conducted as some situation which promotes *thinking aloud* and hopefully data which can be analyzed to reveal how the student is reading, thinking, or, in the case of this study, problem solving. The theoretical base for it is found in the work of Ericsson and Simon (1993). Ironically, perhaps, they summarized much of the work done and the relationship of protocol analyses to information-processing theory—with a somewhat cautious, if not pessimistic, outlook on its potential. Pressley and Afflerbach (1995) have also published a relatively complete review of the methodology acknowledging its strengths and the challenges it presents the researcher. They offer guidelines and explicit instructions on how to make it most effective. The researchers of this study are thoroughly familiar with the methodology and most of the studies reviewed in these two valuable reviews. They have conducted several studies using and substantively developing the technique (*e.g.*, Farr, Greene, and Pritchard, 1992).

The method is somewhat different from that used in the analysis of our study because the students were not cued directly by the researchers to reflect on the processes they were using to solve the problem. The *Chelsea Bank* program, on the other hand, does cue self evaluation of decisions made by directing the students to articulate the consequences of the action they take—from several perspectives, including the customer's, the students' as bank employees, and the bank's.

In addition, it is important to note that we found that the nature of the *Chelsea Bank* program tended to produce data not unlike that generated by verbal protocols. The team-structured approach to making a decision and to generating interactive comments as responses to the program led to the students sometimes explaining their reasoning to each other, creating the kind of data that is generated by *introspective verbal protocol.* It also produced verbalized reactions to the input of teammates. One might have expected that when the students turned to their teachers for help, the exchange would have approximated the kind of cueing and student self-analysis produced in verbal protocol recall. This, however, was not often the case, as the teachers often either merely gave directions or referred the students to the tools of the program, which, as already noted, did tend to serve as a kind of prompt to self-analysis.

Thus, while the articulation of student thought and action provoked by these aspects of the program and recorded on the videotapes did not equal the type of data produced by think-alongs *per se*, it came close in the eyes of our viewers, who are highly trained and experienced in a methodology they have helped develop and refine. We felt that our methodology, which combined observation and verbal protocol analysis, was effective and tended to preclude the kind of problems that develop in introspective verbal protocol from the interruptive nature of the cues that produce the self-reporting. Nor was it subject to the reliance on memory to recall thoughts or reactions *after* the student performance, as is the case with *retrospective verbal protocol* .

In addition, the methodology used in this study did not rely on cues that might, to the student, seem to require thoughts or responses that the student might not otherwise have. The fact that the students were being videotaped may have affected their performance—perhaps to inhibit them and limit their verbal input—but the verbalizations studied were responses to the program, not to the researchers. Thus approaches useful in verbal protocol analysis could be adopted to look at the metacognitive data produced by the students. This enabled us to rate the four major categories and eight problem-solving strategies.

How was the methodology applied?

The primary methodology utilized for this phase of the *Chelsea Bank* study entailed the analysis of 22 hours of videotaping of junior high students from I.S. 218 and eleventh graders from John Jay High School. The videotaping was produced during the 1994-1995 school year. Classroom Inc. provided a log manual, containing a detailed description of the duration of the tapes in addition to the names of all student groups, and interviews with both teachers and students.

The first phase of the study consisted of an analysis of students on the videotapes. Before this could take place, the 22 hours of videotaping were pre-screened and reduced to 6 hours and 23 minutes. At this point, the teacher and student interviews were eliminated because the research team was solely interested in the students' problem-solving interactions. Further refinement of the time intervals was performed. During this revision, inaudible time intervals and retakes (reversals) were discarded. Thus, there were approximately 6 hours for the final analysis.

The time intervals of the students' interaction were found in 25 different videotapes. In order to facilitate the viewing of these tapes, the team decided to compile the time intervals into one single VHS tape.

The videotape was viewed in episodic segments.

The analysis was conducted on the basis of segments. A segment was defined as a unit of activity in which the students were focused on a particular activity. The segment began with the initiation of the video and/or an activity the students were attempting to accomplish. When the students completed the activity and went on to a different activity, the segment was concluded. Sometimes the teacher would interrupt the students and focus them on another issue. This would also indicate a segment change. It would be too general to merely describe a segment as a unit of activity, but that is exactly what it was. Each segment had a clear beginning. The segment concluded as the dynamics of the interaction shifted. For example, students might be working on a scenario, focusing on a customer's account. The segment would end if the teacher interrupts their discussion by having them focus on a different feature.

We chose to analyze the four general categories and the eight problem-solving strategies by segments since we were interested in the behaviors the students engaged in as they worked through the scenarios. We did not want to segment the tapes into arbitrary time units since collaboration and problem-solving interactions would have been lost. This segment analysis based on *episodes* of behavior has been used by Corsaro (1981) and others who have analyzed children's play activities. Corsaro argues that the use of episodes rather than time slices for analysis allows the researcher the opportunity to analyze events which often depend on preceding and subsequent behaviors in order to be understood.

Because of the selection of episodes rather than time segments, some of the segments are quite long and others are quite short. The unevenness in the length of the segments is a limitation in the analysis and is a trade-off for getting more contextually valid analyses.

A total of 50 segments were identified across the 6 hours of video which had been prepared for analysis. The segments vary in length as some are very short, lasting a minute; others are as long as 25 minutes We conducted independent analyses of the division of the videotapes into segments. The researchers agreed in almost every case as to the beginning and end of a segment. Discussion clarified the minor differences in segment division that were found. Table 4.1 provides descriptive information for these 50 segments. Table 4.2 summarizes the different scenarios that were included within these 50 segments. This summary was used as a basis for choosing two scenarios for comparison and is reported in a later section.

Table 4.1 Video Segments Selected and Analyzed (N=50)

School	*Tape Number*	*Start Time*	*End Time*	*Total Time*	*Scenario*
IS 218	36	38.09	49.47	11.38	11) Ms. Austin
IS 218	36	37.13	38.08	00.55	11) Ms. Austin
IS 218	36	30.57	37.12	06.15	11) Ms. Austin
IS 218	25	30.44	39.19	08.35	10) Mr. Smith
IS 218	25	39.20	43.49	04.29	10) Mr. Smith
IS 218	24	47.33	58.00	10.27	10) Mr. Smith
IS 218	23	00.50	17.22	16.32	9) Mr. Jones
IS 218	16	22.30	31.05	08.35	8) Mr. Smith
IS 218	16	09.03	22.28	13.25	8) Mr. Smith
IS 218	13	00.47	11.49	11.02	7) Mickey Mike
IS 218	13	22.05	31.30	09.25	6) Dooley
IS 218	12	09.07	12.32	03.25	6) Dooley
IS 218	12	12.33	30.03	17.30	6) Dooley
IS 218	6	01.03	06.32	05.29	2) John Gumble
IS 218	5	08.21	31.13	23.52	2) John Gumble
IS 218	3	03.19	04.32	01.13	1) Fran Friendly
IS 218	3	24.29	25.36	01.07	1) Fran Friendly
IS 218	3	20.29	22.12	01.43	1) Fran Friendly
IS 218	3	17.25	20.02	02.37	1) Fran Friendly
IS 218	3	04.45	06.29	01.44	1) Fran Friendly
John Jay	38	30.50	36.08	01.18	15) Ms. Highland
John Jay	37	46.49	60.00	13.11	15) Ms. Highland
John Jay	32	30.50	42.00	11.10	11) Ms. Austin
John Jay	31	30.47	35.29	04.43	10) Ms. Smith
John Jay	31	51.26	59.52	08.26	11) Ms. Austin
John Jay	30	31.43	36.40	04.53	10) Mr. Smith
John Jay	30	36.41	43.40	06.51	10) Mr. Smith
John Jay	30	43.41	59.22	15.41	10) Mr. Smith
John Jay	30	30.30	31.42	01.12	10) Mr. Smith
John Jay	29	36.40	40.40	04.00	10) Mr. Smith
John Jay	29	30.50	36.38	05.48	9) Mr. Jones
John Jay	29	56.27	58.59	02.32	10) Mr. Smith
John Jay	28	49.02	59.23	10.21	9) Mr. Jones

Table 4.1 Video Segments Selected and Analyzed (N=50)

School	*Tape Number*	*Start Time*	*End Time*	*Total Time*	*Scenario*
John Jay	20	00.47	04.31	03.44	8) Mr. Smith
John Jay	19	13.48	26.27	12.48	7) Mickey Mike
John Jay	19	26.28	29.40	03.12	8) Mr. Smith
John Jay	18	00.45	10.12	09.27	8) Mr. Smith
John Jay	18	10.13	26.35	16.22	6) Dooley
John Jay	11	00.43	04.16	03.33	5) John Beadle
John Jay	10	26.10	30.43	04.33	4) Jane Smiley
John Jay	10	07.22	26.00	16.38	4) Jane Smiley
John Jay	8	00.08	05.34	05.26	2) John Gumble
John Jay	7	06.37	12.45	06.08	2) John Gumble
John Jay	7	13.16	17.25	04.09	2) John Gumble
John Jay	7	17.26	31.05	12.41	2) John Gumble
John Jay	1	11.54	14.07	02.13	1) Fran Friendly
John Jay	1	25.25	27.41	02.16	1) Fran Friendly
John Jay	1	23.37	25.24	01.37	1) Fran Friendly
John Jay	1	21.12	23.28	02.14	1) Fran Friendly
John Jay	1	16.14	19.12	02.58	1) Fran Friendly

Total observation time 6 hours, 3 minutes, 23 seconds

Table 4.2 Summary of Video Segments Selected and Analyzed
(N=50)

Scenario	*Number of Segments Viewed*	*Total Time Viewed*
1) Fran Friendly	10	91 minutes, 53 seconds
2) John Gumble	6	39 minutes, 34 seconds
4) Jane Smiley	2	16 minutes, 32 seconds
5) John Beadle	1	3 minutes, 12 seconds
6) Dooley	4	33 minutes, 55 seconds
7) Mickey Mike	2	22 minutes, 4 seconds
8) Mr. Smith	5	27 minutes, 27 seconds
9) Mr. Jones	3	6 minutes, 43 seconds
10) Mr. Smith	10	68 minutes, 5 seconds
11) Ms. Austin	5	38 minutes, 48 seconds
15) Ms. Highland	2	11 minutes, 44 seconds

The categories used for the analysis were fine-tuned.

As the analysis of the tapes to identify student and teacher behavior began, three raters worked together on the first five segments to reach to a consensus for rating purposes. These first five segments were reviewed and re-analyzed many times. This analysis, re-analysis, and discussion resulted in a number of changes and clarifications in the list categories and strategies.

For example, the "concepts" category was first called "content." We found that this term was too broad and after much discussion arrived at the term *concepts*, which was defined as the discussion and application of terms having to do with banking, such as *withdrawals, loans, deposits*, and *signature cards*. A problem-solving behavior that seemed relevant when the study began was "visualization," whether the problem solvers describe a scene or event. This behavior has been discussed in the reading literature as readers constructing mental images. The literature on problem solving also mentions this behavior, although it has not been a major focus. Because of the use of the computer as a visual stimulus, references to visual images were not found in the students' verbalizations. After much discussion, this category was dropped.

The literature on problem solving and meaning construction is replete with references to the use of previous knowledge. We had also seen this expressed in our analysis of reader behaviors in previous studies. As soon as we began examining the tapes, we realized we were able to divide this category into the use of *previous specific knowledge* and the use of *previous general knowledge*. Specific knowledge was defined as knowledge and skills that had been specifically learned in the *Chelsea Bank* simulations, while general knowledge was knowledge and skills that were learned prior to (or outside of) the *Chelsea Bank* simulation and were brought to bear on solving the *Chelsea Bank* simulation problems.

Two problem-solving strategies that received a great deal of attention in our initial analyses and discussions *were making predictions* and *making changes*. We felt that the literature on problem solving and critical thinking strongly endorsed the notion that problem solving meant putting forth trial answers and modifying them as a sequenced response. We had also observed these behaviors in our studies of readers as they constructed meaning from text. However, we saw so little of either of these behaviors in our initial analyses that there was some thought given to the possibility of dropping them from the analysis. We did not do so because we concluded that both of these behaviors are crucial aspects of problem solving and critical thinking.

In order to clarify the difference between *collaboration* as one of our four general categories and *collaboration* as one of eight problem-solving strategies, we debated the advisability of changing the name of one of the categories. We did not do so, but we spent much time clarifying the differences between the two until each member of the research team felt the distinctions were quite clear and understandable. *Collaboration* as a general category was the concern as to whether students were able to work together cooperatively. This did not mean that they were collaborating in arriving at an analysis of the problem or whether they collaborated in developing a response. Rather, we wanted to have a general look at whether they worked cooperatively. On the other hand, when we got to the level of the problem-solving strategies, we were interested in whether the collaboration went beyond merely working together. We wanted to know if they developed shared, jointly developed, responses to questions. We wanted to know if they truly cooperated in solving the problem. They could have been quite high in collaboration as a general activity (working together), but not as high in putting their heads together to solve a problem.

Another duplication in labels that necessitated clarification was that of *problem solving* as a general category and *problem solving* as the overall label for the eight problem-solving strategies. As we conducted our general analysis, we wanted to be sure to capture evidence that the students were engaged and focused on seeking the solution to a problem. Anyone who has examined the tapes and observed students engaged in the *Chelsea Bank* simulations comes away with the feeling that the students are engaged in the pursuit of an answer to a problem. We wanted to be sure that our first general analysis captured this data as it existed in the tapes. On the other hand, we wanted to be able to analyze at a deeper level just what the students were doing as they engaged in the pursuit of answers to problems, *i.e.,* what kinds of problem-solving strategies did they seem to be using.

After these many reviews and discussion, the three reviewers felt they were in general agreement as to what they were looking for in the videotapes and how the behaviors would be classified. The clarification of definitions, the discussion of specific examples of the behaviors, and the deletion and addition of several behaviors, resulted in a usable framework for moving ahead with the analysis of the remaining forty-five segments. A list and definition of the four general categories and the eight problem-solving strategies is provided below.

The viewers' analysis scheme included four general categories.

The four general categories of analysis established four descriptors for analyzing each segment:

Basic Skills. This descriptor indicates the extent to which students are engaged in an activity which causes them to use basic skills—including mathematics, reading, and writing. (Listening and speaking are not included since these are constants of most of the activities.) This category includes such things as students reading from the screen, the resource manual, and any other materials. It also includes students writing notes, questions, and ideas about the simulation activity or typing responses on the keyboard.

Mathematics includes any manipulation of numbers. This could be the actual writing down of numbers, developing tally sheets, or doing any other mathematical manipulation whether written down or expressed verbally. It does not include listening and speaking. As much as we believe these are basic skills, there was so much of this in evidence that these would have dominated the analysis.

In addition, computer skills such as keyboarding are not included. The SCANS analysis did focus on these behaviors, and we were interested in this part of the analysis in the more traditional basic skills as assessed on most state and school district assessments.

Collaboration. This descriptor indicates the extent to which students are working together during the segment and exchanging information and points of view in order to develop joint responses. All of the behaviors that would be associated with cooperative learning are included under this heading. Cooperation in sharing tasks such as the use of the mouse, entering data, or keeping notes are included. (Often times the students were working individually but they were cooperating as they did so. That is, the students allowed each other to read and would ask if each other had finished the reading of the screen. They worked cooperatively, but there may have been little collaboration in solving problems and discussing issues.)

Problem Solving. This descriptor indicates the extent to which students are attempting to solve a problem. This category includes evidence as to whether the students were focused on working towards the solution to a problem. This does not mean that they had identified the problem, but merely that they recognized that they were to solve a problem and that they needed to "dig in" and do some things to solve the problem. Another way to consider this category was whether the students were more than just focused. It is possible to be focused and engaged, but not be working towards the solution to a problem. This category attempts to capture the extent to which students were engaged in, and focused on, solving a problem.

Concepts. This descriptor indicates the extent to which basic concepts regarding banking or the general world of work are being emphasized. The *Chelsea Bank* simulations exposed students to a number of banking concepts and basic banking information. We wanted to determine the extent to which the students were using and seemingly understanding such things as the processing of loans, approving and cashing of checks, and other such concepts. We felt it was important to know if a simulation activity such as *Chelsea Bank* fostered student use and apparent understanding of basic concepts that were new to them.

Problem-solving was analyzed using eight strategies.

The final scheme for analyzing the problem-solving behavior of the students videotaped using the *Chelsea Bank* program consisted of eight strategies, which are defined on the next four pages.

Category Definitions	*Category Behaviors*	*Representative Student Comments*[1]
	Students who are ***focused*** are those who search for a solution and grapple with information needs. The ***unfocused*** students are those who have little idea what to do and are ***unengaged*** with the problem. Sometimes one or two of the students will be focused and one or two will be unfocused and distracted. In these cases, the score will not be as high. ***If one or more of the students are focused, the score will be a 2.***	*"This is what we need to figure out." "This is the next step." " We have to do this." " We finished that and we have to figure this thing out." "This is what we are supposed to do." "We have to get this done so we can see if we are doing the right thing." "This is how you are supposed to treat customers, deal with problems, etc."*
Previous Specific Learning Do the students use concepts, strategies, understandings, and skills they have most likely learned from ***previous simulation activities or class instruction*** related to the simulation materials? This category will provide some indication of the impact (carry-over) of the simulation learning as they continue through the scenarios.	Students will be ***looking for information*** and skills they have previously used. They will refer to previous information, skills, or strategies they have learned in previous scenarios or class instruction related to the simulation materials. Examples might include use of the manual, knowing to use the computer keys to move through the scenario, and/or recognizing forms. A score of 3 will indicate students continue to apply previous learning to new scenarios.	*"Here's how we did it last time." " We're supposed to check the _______ like we did last time." " We know what a check (or whatever) is, and now we have to __________." "This is the part where we have to look back like we did last time." " When we did that with the last customer it didn't (did) work." "Yeah, we checked in the manual." "Look in the account and check the signature."*

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[1] These comments were identified in the videotapes in initial analyses and are used here as exemplars.

53

52

Category Definitions	***Category Behaviors***	***Representative Student Comments***[1]
Previous General Learning Do the students ***overtly demonstrate the use concepts, strategies, understandings, and skills they have most likely learned outside of the simulation activities?*** This would include things they have learned from other classes, work experience, home life, neighborhoods, television, etc. This category will provide some indication of the application of learning from outside of the learning materials. It will give some indication of the realism of the simulation materials. It will also help to focus potential suggestions for connecting simulations to more general learning.	Students will be using concepts, information, ideas, and technical skills that were most likely learned in other classes, outside of school or in work experiences. They will remind each other of things they have learned, used, or done previously. They may also demonstrate (without comment) what they have previously learned that was not taught as part of the simulation package. It is expected that this category will seldom receive a score of less than 1 or 2 after the initial scenarios.	*"This is how we did this at work, in another class, or at home." "I remember how to do this from my math class." "This is something I saw happen at the bank." "He's not paying my bills if I get fired."*
Make Predictions Do the students make predictions for problems or situations they face? This would ***be more than just providing an answer***. An answer is always a prediction. However, ***a prediction here is one in which the students express some conjecturing about answers.*** It is more a situation in which the consequences of an answer are considered.	Students will consider what will happen if certain choices are made. They may discuss the choices and consequences or they may merely state them. There will sometimes be several predictions that are weighed along with their consequences. Predictions may be verbalized and/or written (typed) on computer screen.	*"I think this will happen if we choose that answer." "We tried that last time and we got a certain response. I wonder if the same thing will happen again." "They will be on our case if we make the wrong choice." "I wonder what will happen if we do that." "Do you think it will be safe to do this." "That's going to be wrong."*

Category Definitions	*Category Behaviors*	*Representative Student Comments*[1]
Collaborate in Problem Analysis Do the students collaborate in discussing problems they are facing and the outcomes they are considering choosing? In the previous category the discussion would focus primarily on the consequences of decisions. This category has to do with discussions that consider problems and/or choices. The question here is whether students develop responses by discussing and developing choices. They do not need to discuss consequences but merely the problems and the response choices (answers) for those problems.	Students will develop understanding of problems and/or answers to problems by putting their ideas together. They will discuss different aspects of the problems and answers. Several students will be observed overtly contributing to the development of these responses.	*"Here's my answer to the problem. Do you have any ideas to add?" "I think we also need to figure out this part." "It's not enough to do just that. They're asking for more than that." "Who has some other ideas we can add?"*
Recognize Confusion Do the students ***recognize when they have a problem about what to do next***, the nature of the scenario problem, or the structure and sequence of the scenario? It may also be that they recognize a correct response--even if the recognition is after they check for the correct response.	Student(s) will indicate through gestures, actions, and words that they are confused. They will often seek help. However, the help is directed toward the specific problem they have recognized.	*"This doesn't make sense." "I don't understand what we are supposed to do." "This is very confusing." "Did anyone see any other group having this problem? What did they do?" "This is a part where I don't know what to do."*

Category Definitions	*Category Behaviors*	*Representative Student Comments*[1]
Make Changes Do the ***students make changes in their potential responses?*** Are they able or willing to make changes in problem understanding, responses to problems, or in taking a different course of action.	Many problem solvers do not develop a willingness to back off and ***try an alternative***. Once they have arrived at a specific response, they tend to stick with that answer or direction. They seem willing to wait to be told they are wrong and they want to be told what to do. ***We are looking for problem solvers who are willing to revise strategies, and make changes in problem understanding and responses to problems.***	*"I think we ought to try something else." "This answer doesn't seem right to me." "Let's start over and see if we can come up with a different choice—or way of working out the problem."*
Seek Help Do the students ***search for help when they are confused*** or merely need additional resources? This could include ***asking the teacher***, using simulation ***resources***, or checking with any other references. It would also include strategies for getting information—like careful rereading of materials, examination of the manual, further discussion, or review of activities.	Many students are not efficient when it comes to looking for help. They are ***unwilling or unable to tap the resources*** needed to solve problems and move ahead with their solutions. They may seek help by calling the teacher to assist--or they may ask the teacher--even when the teacher is present.	*"I think we should look back in the manual because that's where the rules should be." ""When we got stuck last time, we reread the choices. Let's try that again." "I think we need to check with the teacher about the choices, directions, or information."*

The analyses of the 50 videotaped segments were recorded on customized coding sheets. An individual sheet was used for each segment to code the analysis of the four major categories and the eight problem-solving strategies. A sample of the sheet follows:

Tape Number ____ **Time Segment Began** _____ **Time Segment Ended** _____
Names of Students ______________________________ **Scenario Number** _____
Teacher Involvement _______________

Brief description of the segment. Include any of the following key words if they are appropriate to the segment: discussion, reading, writing, mathematics, discussion, computer, collaboration,

Segment Description: Brief summary of activity

Four General Categories

Basic Skills	**Collaboration**	**Problem Solving**	**Concepts**

0 = No activity on this category during this segment
1 = Limited activity but is not a major emphasis
2 = Major activity, but it may not be intensive all they way through the segment
3 = Major activity throughout the entire segment

Eight Problem-Solving Descriptors: Analysis of Problem-Solving Activities

Category	***Rating***	***Notes***
Focused on Problem		
Previous Specific Learning		
Previous General Learning		
Make Predictions		
Collaborate in Problem Analysis		
Recognize Confusion		
Make Changes		
Seek Help		

0 = No activity on this category during this segment
1 = Limited activity but is not a major emphasis
2 = Major activity, but it may not be intensive all they way through the segment
3 = Major activity throughout the entire segment

At this point, the raters divided the 50 segments equally among themselves. Segments were then viewed by two observers (independently) at all times. Each rater had approximately 33 segments to analyze. Each rater *reviewed* half of his or her segments in common with one of the other raters and the remaining segments in common with the other of the three raters. All ratings were conducted independently, and comparison and discussion sessions were held after the completion of the ratings.

Each rater had to observe and analyze the segments by coding the general categories and problem-solving strategies. Moreover, the observers had to discuss any segment for which there was a coding difference of *2* or higher (based on a scale of *0-3*) between their two ratings. (The rating form is provided above.) Agreement to within *1* on the rating scale was attained by viewing the segment together and discussing their discrepancies until agreement had taken place. The initial reliability (consistency) of the ratings *prior to any discussion* are discussed below.

***Teacher involvement* was added as a category to the analysis.**

Although these segments focus on the students' interactions, teachers' involvement is also analyzed. Throughout these tapes one can listen and view how the teacher interacts with the learners. Therefore, a category was added in order to describe teacher involvement. The amount of involvement is categorized between a *0* (no involvement) to a *3* (answers/asks many questions and directs almost the entire segment).

There was high reliability of the ratings across coders.

Table 4.3 and Figure 4.1 provide data regarding the consistency of the coding for each of the segments. The agreements in Table 4.3 are organized by the three major category groups that were analyzed. The first is the degree to which the teacher was involved. The second group contains the four general categories. The third provides data on the eight problem-solving strategies that were observed.

Each segment was coded by two different coders. The segments were assigned to the coders so that each of the coders rated a common set of segments with each of the other two raters. The consistency of the coding indicates that across the 50 segments and 650 categories (13 X 50) the coders were in exact agreement 82% of the time, and over 99% of the time the ratings differed by a point or less.

Some of the differences in ratings are attributed to the length of the segments, which ranged from about a minute to twenty-five minutes. The average segment length was 1 minute 17 seconds, and the standard deviation was about 1 minute. During these segments, a number of different things were occurring which led to some inconsistent ratings. However, the team felt it was important to analyze segments that had a holistic integrity as the students dealt with a particular problem. The raters also rated segments more than once in the initial stages of the process to check on their own consistency of ratings. For instance, the first five segments were reviewed at least a dozen times and the next five about five times by each of the raters.

In the beginning, the inconsistencies in the ratings were significant. However, with clarification, discussion, and revisions of categories, the rating consistency increased. The raters attempted to arrive at 100 percent agreement with these initial segments before moving to the larger database. The agreements and disagreements in the ratings were the basis for extensive conversations about what was observed and not observed, and this led to clearer understanding of the meanings of the various categories.

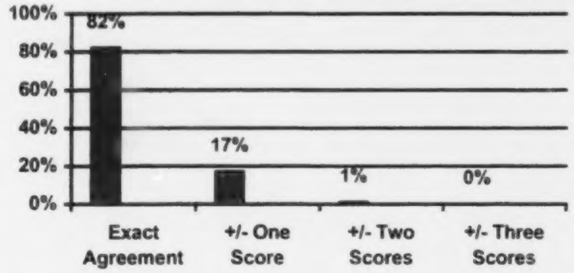
Table 4.3 Agreement of Coding
by Three Viewers for 650 Video Segments (%)

Category	*Exact Score*	*Within One Point (+/-)*	*Within Two Points (+/-)*
Teacher Involvement	45 (90%)	5 (10%)	0
Four General Categories			
1. Basic Skills	44 (88%)	6 (12%)	0
2. Collaboration	46 (92%)	4 (8%)	0
3. Problem Solving	39 (78%)	11 (22%)	0
4. Concepts	38 (76%)	11 (22%)	1 (2%)
Eight Problem-Solving Strategies			
1. Focused on Problem	46 (92%)	4 (8%)	0
2. Previous Specific Learning	31 (62%)	19 (38%)	0
3. Previous General Learning	42 (84%)	7 (14%)	1 (2%)
4. Making Predictions	43 (86%)	7 (14%)	0
5. Collaboration in Problem Analysis	40 (80%)	10 (20%)	0
6. Recognize Confusion	36 (72%)	14 (28%)	0
7. Make Changes	44 (88%)	6 (12%)	0
8. Seek Help	38 (76%)	9 (18%)	3 (6%)
Total	532 (82%)	113 (17%)	5 (1%)

The lowest agreement was in the category of *Previous Specific Learning*. This category was defined as whether or not students were using knowledge, skills, and information they had acquired during previous *Chelsea Bank* scenarios. Many of the disagreements arose over the use of computer skills. Some of the raters were sure the students were using computer skills they had acquired previously while others felt the skills were general skills the students brought with them to the task. A second area that caused the coders to disagree was that of *Recognize Confusion*. The category was defined as instances where the students indicated that they knew they were confused and did not know what to do next. Sometimes the coders felt the students were confused, but they knew where to turn for help. Other times the coders felt the students were confused, but they did not recognize that they were on the wrong track.

Despite the limited range of the scale, the ratings did seem to be remarkably consistent across the 50 segments. Determining the reliability of the ratings engendered among the team a feeling that they understood distinctions across the categories they were looking for and that they indeed had a reliable system of describing what the students were engaged in as they completed the *Chelsea Bank* activities.

Figure 4.1: Percent of Rater Agreement for 12 Categories from the Video Segments



What did we find out about student behavior during the scenarios?

An analysis of student interaction during the 50 segments identified while the students worked on the *Chelsea Bank* scenarios revealed that they were engaged and focused on the task at hand. Student behavior during the segments was rated on four general categories:

1. How much *Use of Basic Skills,* such as reading, writing, and mathematics, took place in the segment as the students worked to solve the problem presented?
2. How much *Collaboration* was there as the students worked on the problem?
3. To what extent did the students concentrate on *Problem Solving*?
4. Was there *Use of Banking Concepts* as the students worked?

All four of these categories were rated *2* or above on a three-point scale, and comments recorded during interviews with teachers and students using the program appeared to confirm that the participants considered these considerations an important result of the program as well.

Overall, the students utilized a variety of basic skills; they were indeed focused on solving the problems presented; and they demonstrated that they had learned and were continuing to learn a variety of basic concepts related to banking. The degree to which collaboration was observed is discussed below. All of these conclusions can be derived from an examination of the ratings of the four general categories included in Table 4.4 and Figure 4.2. In addition, samples of teacher and student comments that reinforce the observations of the viewers are included in this report.

How prevalent was behavior related to the four general categories?

The ratings of the four general categories were determined by judging holistically what was seen during the entire segment. As already detailed, each segment was rated by two viewers and their ratings were averaged; and as the reliability already reported shows, there was very high agreement between reviewers across segments. The behaviors that were the focus of the four general categories may not have been occurring continuously, so the judgments were based on the viewers' analysis as to how strong or weak these behaviors were throughout the segment. A score of *3* indicates the judgment that the behavior was strongly exhibited, while a score of *0* indicates that the behavior was not seen at all.

Use of Basic Skills. The *Use of Basic Skills* category was rated highest of the four general categories (2.76), and the standard deviation for this category was the smallest (.51). The students were reading, writing, and using basic math skills throughout the segments. The raters varied little in their judgment that basic skills were seen consistently and strongly throughout all of the segments. This supports one of the main emphases of the Classroom, Inc. goals to get students to develop their basic skills through use in practical applications.

While teachers welcome the amount of mathematics the program involves, many feel that it could require more reading and writing:

- "…a weakness of the program is that it does not involve enough reading and writing; [it could require students to take] notes to inform decision making."
- "I like *Chelsea*…because there is more math….It focuses on money and thinking mathematically."

At the same time, several teachers commented on the demands of the reading and writing required in the program:

- "There were no other problems in reading the information off the screen."
- "Sometimes the language is too difficult. Some of the terms…are not familiar to them."
- "Sometimes the students had difficulty putting their decisions…into words. They seemed to know what the consequences were, but they had difficulty writing what they thought."

The students who were interviewed clearly thought there was a great deal of reading and writing:

- "Reading—there's a lot....you have to read everything....they don't talk to you. If you don't read, you don't know what is going on. [The] reading [is] not hard—in [the] manual or glossary, and you can access that any time. Writing—yes, in [the] bank [setting], no, in [the] hotel. [In the] bank—you have to write for it to be accepted as [the] answer."
- "Lots of reading....you have to read fast—lots of pressure to read fast. I want to stop the time sometimes."
- "Need to write a report about why I made the decision. Samuel did the writing—had to write what the problem was."
- "[We are] writing [because] we'd jot everything down."
- "[We've] got to read what they say. [And we] go to [the] manual, and it tells you what to do."
- "Michelle usually reads it aloud; [and it's] not too hard. We can read the words but sometimes [the] sentences are hard to understand."
- "We had [the] computer to give help, but a paper manual would have been good."

Although the students were able to cite the reading and writing they felt the program requires, some felt, as did the teachers, that the program involves mathematics more:

- "You look at [a] check....you learn about checking, math. You are a teller....the math is the most memorable because it is the thing you think about the most.
- "...basic math helped."

Problem Solving. It is also clear that along with using basic skills, the students were engaged in *Problem Solving*. The viewers felt that there was seldom a time when they were distracted from the focus of the scenario. They were engaged in searching for an answer and determining what they were to do next. This does not mean that they were involved in all aspects of *problem solving* as that term has been defined by a variety of researchers and theorists, but it does mean that they followed the scenario problem and searched for a response to the situation. The rating of 2.24 for *Problem Solving*, and the modest standard deviation for this score, indicates little variance in this highly ranked behavior.

Both the students and the teachers emphasized problem solving as perhaps the most prominent requirement of the program. The students' comments about these demands reflect a genuine enthusiasm:

- "Decision making was the hardest thing—kept getting fired. Why? Decision making is hard because you want to be right."
- "We learned to work it out, [even if we were] not always right; [we learned to] look at other points of view."

- "There's thinking…about the problem; think what to do next—why [a] decision affects you, the rules to follow, and about the customer."
- "We had to evaluate to make [a] decision; there was nothing in the manual guide for this problem."
- "If you don't think about it, you don't get it."
- One student emphasized how good decisions depend on good information.
- "It keeps your brain going—in school, out of school."
- "*Chelsea* is a lot of thinking."

Just a few samples show how their teachers were equally enthusiastic about this aspect of the program included these:

- "The most important skills they are learning are critical thinking, problem solving, and professionalism."
- "They had to think about the consequences. It was good for them to think about that problem."
- "They make decisions based on the problems. It goes beyond the surface—*why* do this? Regular class [activities don't] always do this. [Giving this kind of] education in books is one way; [these] simulations [come] closer to reality, real experience."
- "[The] kids are…learning…decision making, teamwork, negotiation."
- "[Among] the most important things the students learned were…understanding options and feedback—they want feedback."

Use of Banking Concepts. The rating of *Use of Banking Concepts* (2.19) indicates that as the students worked on the *Chelsea Bank* scenarios, this behavior was taking place to a significant degree. The range of scores as indicated by the standard deviation indicates that there were times that the use of banking concepts was not very strong, but this would be expected as students could not be expected to use banking concepts all of the time.

Teachers felt, as one said, that learning new concepts such as banking and money was almost as important a result of the program as practicing basic skills and problem solving. Other comments about this category included:

- "Helps kids to understand jobs, areas for the future."
- "They are…learning basic concepts about balancing checkbooks, counting money, etc."
- "Some of the terminology was difficult, but I tried to cover that in business class."

Student comments during interviews often revealed a newly developed interest in banking and banking concepts, but most often students commented on learning skills relevant, but not exclusive, to banking, such as dealing with people and working with computers:

- "[I] learned how to work as a teller….Each customer has a new problem."

- "[We] talked about several of the types of tasks including check cashing, opening accounts, etc." This student found that a bank teller's job is not boring.
- "I now know more about banking when I go to the bank with my mother."
- One student stressed a point made by numerous others: learning to deal with people. He felt he learned how to put up with people and to treat people appropriately, how to manage money, generally what a bank teller does, and computer keyboard skills.
- Another student emphasized the value of learning about management in the business world.
- "Computer skills and technical problems with the computer were not big problems....We learned a lot."

Collaboration. The general category *Collaboration* was rated 2.16 overall. In rating this category, the team was looking for the degree to which students worked together. For example, when one student handled the mouse and another entered information from the keyboard, while a third watched and commented on their progress, a viewer would record evidence of collaboration. But the students sometimes worked independently even though they were all seated in front of the computer and were working on the same scenario. They seemed to be working independently in parallel fashion rather than cooperatively. Many times one student would come up with a response to some detail of the scenario and ask the others what they thought of the solution, and they would usually agree with the response with little discussion, debate, or modification of the suggested response.

Teachers and students emphasized the importance of collaboration so continuously in their assessment of their experience with the program that this emphasis must be considered when noting that while the viewers rated collaboration high, it was the lowest of the four main categories.

The students discussed both their success in working together to solve the problems presented in the program and problems they encountered working together. For example, they noted that collaboration was limited by team members who were absent, by some teachers' control over the role played by particular members of a group, by reticent team members, by fellow students who tended to exercise control over the computer, etc. Frustration with other team members appeared strongest among students who were inclined to assume leadership roles:

- "I could do it by myself. When it's two against one, you have to choose, [and] you can be wrong. I felt good being the leader."
- "My group had three people. They bother me too much; they talk too much.... We need to work as a team to make decisions, to take turns—on [the] mouse, the keyboard,...[reading] the manual out loud."
- "I liked the group work; they helped me if I had a problem; our group got along."

- "We learned to work it out—not always right. [We learned to] look at other points of view. [The] most important thing [was]…working together."
- "In our group we cooperated; we switched every session. We just did the switching. Sometimes you get along; sometimes you don't. [Things work out] if you get on their tails; [you may] have to push others to get [your] grade."
- Sometimes you don't get along with people but you have to learn to understand others [and] get along."

Clearly, it was the structuring of teams that made teamwork a necessity and created the opportunity for, and importance of, collaboration. Many comments from the teachers echoed this:

- "They need the group work! I let them choose their own partners."
- "Working cooperatively…they understand relationships. One student at each computer wouldn't work. They have to learn to take different roles and work with other students."
- "I think they are learning to work with others. They talk…and work through their differences. Sometimes they get upset."
- "The team work is critical. In a group, a poor reader…may be a great calculator, [and the team approach gives] him or her a chance to participate."

Thus the teachers invariably stressed the program's potential to get students to respect each other, to listen to each other, to compromise, and to collaborate—to collaborate effectively.

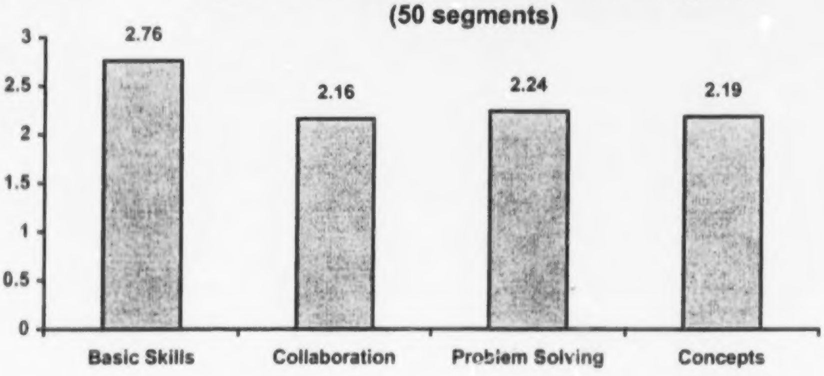
In defining problems, as well as in developing responses, there was not a great deal of collaboration noted by the viewers, however, as will be shown in the examination of the eight problem-solving strategies.

What can be concluded about the four general categories? The overwhelming conclusion is that the students were focused on solving the scenario problems and they applied a variety of basic skills. They used banking concepts as they went about their tasks and to a slightly lesser extent they collaborated in their work. However, the collaboration could be characterized as "cooperation" and "offering mutual support"—as opposed to *interaction* that truly reflects collaboration in developing a product.

Table 4.4 Ratings of the Four General Categories

Categories	*Mean Rating*	*Standard Deviation*
1. Use of Basic Skills	2.76	.51
2. Collaboration	2.16	1.02
3. Problem Solving	2.24	.88
4. Use of Banking Concepts	2.19	.91

Figure 4.2 Ratings of Four General Categories (50 segments)



Were the students using the eight problem-solving strategies?

The area of *Problem Solving* was characterized by eight strategies based on a review of the literature on problem solving as well as on an analysis of what was seen during the fifty segments. Were the students engaged in problem solving? Or were they merely going through a series of activities which they felt were parts of the procedure required to determine a correct answer? Is this just a linear program that focuses on following prescribed steps while calling for little thinking—or is it a program which emphasizes independent thinking in identifying problems, conjecturing about solutions, and modifying responses to fit each situation?

The analysis we conducted suggests that the program is linear and that students are pushed to find the "best answer." However, they are also led to determine what the problems are, to learn to use resources, and to consider the consequences of their responses.

The eight *Problem-Solving Strategies* examined during the segments were:

1. How *Focused on the Problem* were the students during the segment?
2. How often did students use *Previous Specific Learning* gained from the *Chelsea Bank* program?
3. What evidence is there of students pulling *Previous General Learning* into their problem-
4. Do the students *Make Predictions* while solving the problems?
5. How much *Collaboration in Problem Analysis* takes place?
6. Do the students *Recognize Confusion* when they are indeed confused?
7. Do the students *Make Changes* in their thinking as they solve the problems?
8. Do the students *Seek Help* when they need it?

In discussing their experience with and reactions to the program during interviews, teachers and students had more to say about a few of these strategies than about several others. Their comments are included to help explain the ratings based on what the viewers saw.

Focus on the problem. The *Problem-Solving Strategy* that was rated the highest was that of being *Focused on the Problem*. This was expected because each scenario was structured to present the students with a problem to be solved. However, the students did more than accept the problem. There was considerable discussion of the nature of the problem and about what they were expected to do in response to the problem.

Had the problems been more open-ended, it is possible that they might have promoted more analysis, but one wonders if this might instead have led to the students becoming lost while trying to determine what they were to do. The high rating (2.94) for this strategy and the relatively small standard deviation indicates that the students focused on the problem and that they were constantly discussing or mentioning the problem.

Many of the comments from teachers and students about this general category indicate quite clearly how intent the students were on defining and solving the problem. Two additional quotes—the first from a student and the second from a teacher—are typical of what the interviews revealed about the focus on the scenario problems in these classrooms:

- "…learn the problem; go to the problem; figure it out; go on to the next customer. We talked it out in our group and then [would] do over what we had to do."
- "[They] look at [a] problem from global and specific perspectives. [They learn how to] make an appropriate decision and to be able to justify that decision. It encourages metacognition."

Collaborating and using the Chelsea experience. Two problem-solving strategies which were operating across the segments at a moderately high level were *Collaboration in Problem Analysis* and the use of *Previous Specific Learning*. It should be noted that the strategy of using previous specific learning was rated only in response to information and knowledge students had gained from previous *Chelsea Bank* scenarios. For example, the use of the various tools was evident as was other information gained from previous scenarios.

These two categories were each rated at about 2.0, indicating that the students often talked with one another about the nature of the problem in which they were engaged and how they might solve it. In doing so, they used previous information they had learned in other scenarios. These two categories give strong evidence of students' willingness to share their understanding and analysis of a problem and their ability to gain knowledge and then apply it in subsequent situations.

Several comments from teachers are typical of how the teachers' enthusiasm for the program's demand for collaboration was frequently specified as that needed for problem solving:

- "I think that what they learned most from the simulations was teamwork (problem solving as a group). Next in importance was sharing decisions."
- "I don't think the simulations would be as effective if the students worked alone. They wouldn't have anyone to interact with and to learn from. They need to check with a peer and discuss their choices."

Student reports verify what the teachers noted about collaborative problem solving:

- "If we didn't agree, we'd work it out."
- "We talked, argued about [the] decision. We made the wrong decision one time and we felt bad—the boss yelled at us."
- "[We had to] make [a] decision. He said no. [I] asked why. We negotiated the decision."

The students' comments about how they learned about banking and the *Chelsea Bank* in particular may seem obvious, but they illustrate their awareness of how they were applying—or would have liked to apply—previous specific learning:

- "[I relied on the] *Chelsea* manager's guide book. I liked the investigation aspect—looking for information. That also makes it fun and interesting. At [the] bank, [I] can go back and run a check on them."
- "What's hard [is when I] don't know what to do; [I] have to go to [the] manual, and sometimes the answer is not there."
- "It got easier to count money."
- "…our group did get more comfortable with handling the problems." This student felt that some students got jobs because of the simulations.

Some teachers—but not all--stressed the importance of learning and applying this specific experience gained from the program:

- Several noted that assessments designed for the program should measure to some extent how much the students have grasped about banking. Another teacher, however, specifically argued that the assessment should not cover banking procedures, but rather general skills learned, such as cooperation. (Clearly, the assessment will need to involve the grasp of previous specific knowledge *as it serves subsequent problem solving.*)
- The *Chelsea* program was attractive to some teachers because what could be acquired from it about banking and then applied required the use of mathematics.
- One teacher's implication was clearly that the practical information is very important: "I'd like to move beyond simulations to job experience."

Recognizing confusion and seeking help. Factors operating in both *Collaboration in Problem Analysis* and use of *Previous Specific Learning* were the students' ability to *Recognize*

Confusion—rated .89—and their willingness to *Seek Help*—rated 1.07. The first of these involved knowing that they needed help, and the second included being aware of where to look for help. While these strategies may seem, on the surface, to be rather low-level aspects of problem solving, they are defined by some researchers and theorists as the epitome of problem solving. To know when you don't know and to seek the help you need, they argue, is the highest level of problem-solving behavior.

The viewers saw only moderate evidence that the students were engaged in these activities, however. There were times when teams were unsure about what to do next, but these times were often related to the mechanical aspects of completing a scenario rather than an understanding of what was confusing about a problem. Comments were often of the nature of "What do we do next?" rather than, "I can't understand why the situation can't be solved this way?" The search for help was focused almost entirely on the use of the tools provided with the scenario or a raised hand requesting teacher aid.

It would have been very encouraging if students had on occasion conjectured about a problem, brainstormed about what was known about the problem, and then developed alternative solutions to the problem. This kind of thoughtful understanding of problems and sharing and conjecturing about solutions was not often seen.

Several teachers accounted in the interviews how students tended to call to them for guidance when the students recognized that they were confused, and a few others emphasized that they reminded students about the help tools provided in the program. A few students, too, confirmed what the teachers said about confusion leading to a call to the teacher. Several mentioned the manual, guides, and rules as sources of information that could resolve questions arising during problem solving.

One possible reason for the low scores on these two problem-solving strategies is that the program appears to put considerable emphasis on negotiation. Studying student comments about collaboration, for example, suggests that disagreement among members of a team about what to do might be considered recognition of confusion. Such differences of opinions needed to be resolved, if possible. One way a few students noted doing that was reviewing the information presented in the scenario. If what these students report was going on, the viewers may not have noted it as recognition of confusion. They did note calling for the teacher and consulting the guide book and other program features as seeking help.

- "When the students were having problems figuring out what to do, they would call me over for help and to ask questions. Arguing was an indication that there was a problem. Their voices got louder and the argued about the responses."

- "The biggest problems students had was when they couldn't decide who was right. I would urge them to go back and use the information sources and think their way through the problems."
- One student noted that the teacher intervened only when the group had made all the wrong decisions.
- "…if we don't get it, ask the teacher."

Seldom-used strategies. The aspects of problem-solving behavior that were scored lowest across the 50 segments were those of using *Previous General Learning* (.39), the inclination to *Make Predictions* (.39), and the decision to *Make Changes* (.18). The standard deviations for these three strategies are large enough to indicate some variance in the frequency of their occurrence. However, the low scores indicate they were not observed very often.

The infrequent use of previous general learning was perhaps the most surprising. We had expected students to apply ideas, knowledge, and perhaps even problem-solving strategies they had learned elsewhere. However, such was not often the case. The extensive research on the limitations of transfer of learning should, perhaps, have made us less optimistic about this. The students seemed to treat the *Chelsea Bank* experience as a separate, albeit interesting and engaging, activity. They did not appear to associate it with other school activities and projects or with those that occurred outside of school.

One very strong probability for the lack of use of general information is that many students in these classes had very limited knowledge gained from the experience of going to banks. There were indications from the interviews that substantiated this. Thus knowledge about banks and banking was not available in their backgrounds. Also related to the low use of previous general knowledge is the probability that the students would not in a normal discussion verbalize their prior knowledge. This would not mean that they would not be using it necessarily—only that it could not be observed. It is easy to see what they are saying and doing to solve the problem at hand, but their use of prior knowledge is far less obvious.

In the light of the low rating for this strategy, teacher comments from the interviews—such as these examples—about transfer of learning become quite revealing and important, we think:

- "Many of [the students] made connections to home concepts, such as balancing the checkbook. They said they now feel more comfortable in a bank and they know more about what a bank is all about." This teacher also reported that the class had to lay out a bank in a class exercise—showing where all of the different components would be.
- "The bank is more familiar to them, and the hotel is not so familiar. There is more immediate application for *Chelsea*.

- "The math teacher is doing some things with *Chelsea Bank* in math class. I'm not sure how we could get the integration with other subjects going, but I think [it] could be done...."
- "There was not much communication with other teachers in the schools about the program."
- "The reality orientation was important, but there are some students who had not been to a bank. We had to discuss why the various incidents might have happened. For the project, we would spend 20 minutes discussing a previous scenario."

Student comments indicate that a transfer of general learning was going on but not necessarily observable:

- One boy who was working as a department manager in a large drugstore in downtown Brooklyn said he sees similar problems: the need not to lose one's temper with customers, the need to be patient, the importance of listening.
- One girl who was working in a bank noted to her teacher that there was more reading and writing in the real-world bank than in the simulation.
- A student reported how his math teacher had been willing to field questions that grew out of the *Chelsea Bank* experience.
- A student noted how there is—as at *Chelsea*—often a line outside real banks.
- One student reminded us that transfer works both ways but said that nothing from the classroom experience helped outside of school.
- "Out of school, [we need to] learn patience; I understood [the] stress…clerks [face]."
- "Personalities play an important part in real life, too."

Perhaps the lack of any making of predictions or changes was most closely related to the structure of the scenarios. While the students were to consider consequences, they were seldom asked to make any other predictions about the problem or possible solutions. They went through the scenarios in a step-by-step fashion, focusing on, "What do we do next?" Since there were few predictions and only limited conjecturing about solutions, it is not surprising that there was little evidence of modifying predictions or answers. The students would select answers, and to some extent that was a prediction. However, it was taken from a list of alternatives. When the students had the wrong answer, they were not expected to develop a different response.

Several student and teacher comments reflect on making predictions and changes:

- One boy expressed approval of the program because it made him think about the decisions he had to make—that the manager's guide didn't give all the answers.
- One student noted what several others implied: that fear of making the wrong decision became a kind of incentive for considering consequences: One bad decision affected everything.
- "…you had to make hard choices. [We] need[ed] to use common sense…as a group and come up with a good choice."

- Another student suggested how important prediction was in the program: "…always investigate before making a decision; get someone else's opinion; don't act [as if] you're always right; learn how to weigh alternatives; compromise."

In the light of how seldom viewers identified this strategy, however, one teacher's comment becomes highly significant: "Some students always wanted to skip steps and just kind of guess what the best response was."

Many of the student comments about problem solving and about collaboration indicated either that they felt they had made adjustments and changes or that they wished that the program had allowed more of an opportunity to do that:

- One student emphasized how important it was to explain and review decisions and to understand how they affect others.
- One aspect of the simulation that one boy did *not* like was that he wanted to go back and change decisions. He mentioned the problem with the vacation request from the cleaning lady. He said that he would like to change that decision. He said that when you have better information, you can make better decisions.

Again, a teacher's comment is highly indicative of what was happening—change making was a part of the process that *preceded* decision making. Once the latter was done, the die was cast: "The biggest problems students had was when they couldn't decide who was right. I urge them to go back and use the information sources and think their way through the problems."

In summary, were the students engaged in problem solving? The answer is a clear *Somewhat*! Given the structure of the scenarios, there were some aspects of problem solving that were limited. On the other hand, students did not show a lot of overt evidence of thinking about the problems to a great extent and they did build their understanding and skills from one scenario to the next. What they did not do to any great extent was to conjecture and predict responses, to make connections with knowledge and skills beyond *Chelsea Bank*, or to learn to fix up and change responses so they would be more appropriate, effective, or clear.

Table 4.5 Ratings of the Eight Problem-Solving Strategies

Strategies	*Mean Rating*	*Standard Deviation*
1. Focused on Problem	2.94	.19
2. Previous Specific Learning	2.05	.79
3. Previous General Learning	.39	.62
4. Make Predictions	.39	.87
5. Collaboration in Problem Analysis	1.96	.99
6. Recognize Confusion	.89	1.03
7. Make Changes	.18	.40
8. Seek Help	1.07	1.07

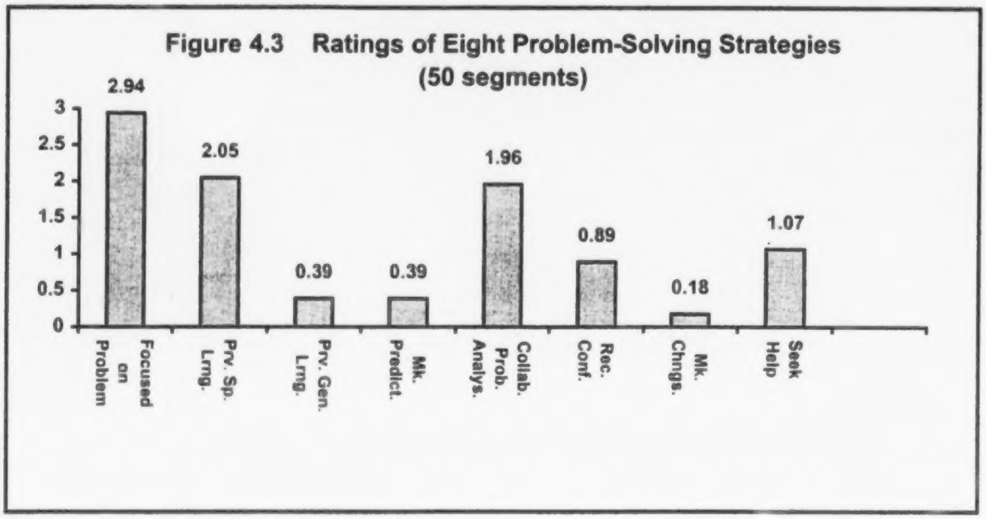


Figure 4.3 Ratings of Eight Problem-Solving Strategies (50 segments)

How did teacher presence affect student problem-solving behavior?

A major factor that seemed to affect the students' behaviors was the presence or absence of the teacher during the time the students were working. The team felt that this factor significantly affected the students' behaviors. It was, therefore, decided to rate the extent to which the teacher was present and involved during the duration of each of the segments.

The percent of each of the four ratings are shown in Figure 4.7. The ratings ranged from not involved or *none* (*0*), to *extensive* involvement (*3*). It was decided that for analysis, we would combine those segments for which the teacher received either a *0* (not involved) or a *1* (limited involvement). In segments rated *0* the teacher was not seen at all. In segments rated *1* the teacher was seen, but for only a short time; the teacher may have made a passing comment, but s/he did not become involved in the lesson to any extent.

We then decided to compare the combined *0* and *1* segments to those segments in which the teacher was rated as extensively involved (*3*). This meant that we were emphasizing the differences, since we were not analyzing those segments in which the teacher was somewhat involved (*2*) at all. We felt that in comparing the segments rated *0/1* to those rated *3*, we would emphasize any effect the teacher may have had.

There were a total of 27 segments in which the teacher rating was *0* or *1* and a total of 9 segments in which the teacher rating was *3*. Thus the total numbers of segments in each category was a ratio of 3:1. However, the difference in length—the total amount of time consumed by the segments in each rating category—was not quite as large. The 9 segments for which the teacher rating was *3* covered a total of 58 minutes (almost one hour) while the 27 segments that were rated *0* or *1* covered a total of 144 minutes (two hours and 24 minutes).

Table 4.6 and Figure 4.4 show the differences in the four general categories with the teacher present and the teacher not present. When the teacher is present, the students are often involved in a question/answer dialogue with the teacher and, as a result, the basic skills activity and the student collaboration decline. The differences in the problem solving and the banking concepts categories are small, suggesting that teacher presence has little impact. This is probably because the students are focused on the problem at hand whether the teacher is present or not and they use banking concepts in either case.

A similar pattern is revealed for the eight problem-solving strategies, shown in Table 4.6 and Figures 4.5 and 4.6. When the teacher is extensively involved, there is a significant decline in collaboration in problem analysis. On the other hand, the strategies of seeking help and recognizing confusion increase significantly. When the teacher is present, s/he is often there at the behest of the students, and/or the teacher has recognized the students are having difficulty. Figure 4.7 shows the overall percentage of ratings for teacher involvement.

Table 4.6 Ratings of the Four General Categories and Eight Problem-Solving Strategies For High and Low Teacher Involvement
(High 9 Segments, Low 27 Segments)

	Mean Ratings		*Standard Deviations*	
Categories	*High*	*Low*	*High*	*Low*
1. Basic Skills	2.39	2.87	0.82	0.32
2. Collaboration	1.17	2.26	1.11	0.95
3. Problem Solving	2.22	2.13	0.97	0.91
4. Concepts	2.0	2.13	0.75	1.05
1. Focused on Problem	2.89	2.94	0.22	0.21
2. Previous Specific Learning	1.83	2.06	1.06	0.73
3. Previous General Knowledge	0.50	0.33	0.70	0.60
4. Make Predictions	0.44	0.31	0.92	0.83
5. Collaboration in Problem Analysis	1.06	2.17	0.95	0.96
6. Recognize Confusion	1.44	0.50	1.07	0.88
7. Make Changes	0.06	0.13	0.17	0.42
8. Seek Help	1.33	0.81	1.19	1.06

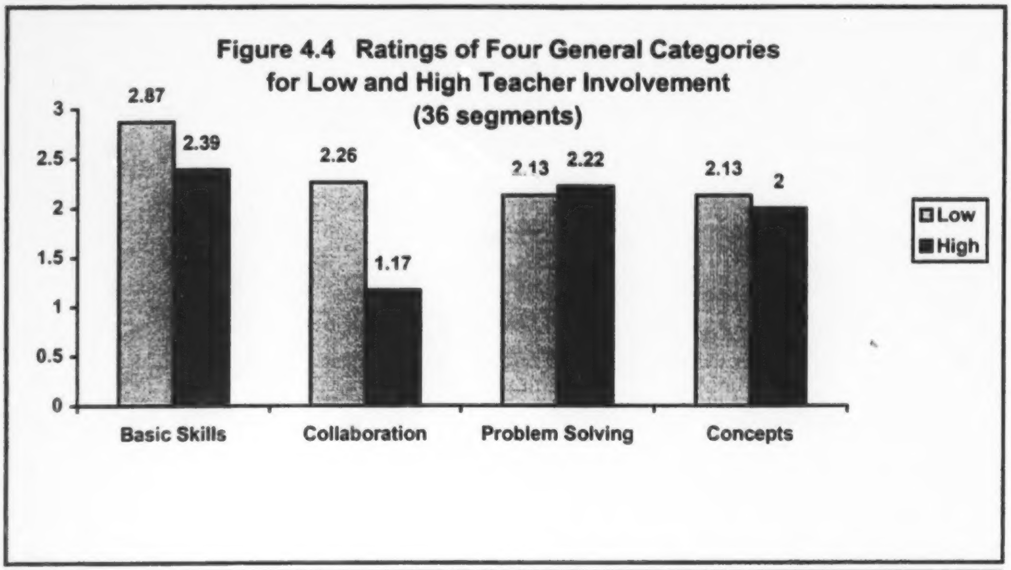


Figure 4.4 Ratings of Four General Categories for Low and High Teacher Involvement (36 segments)

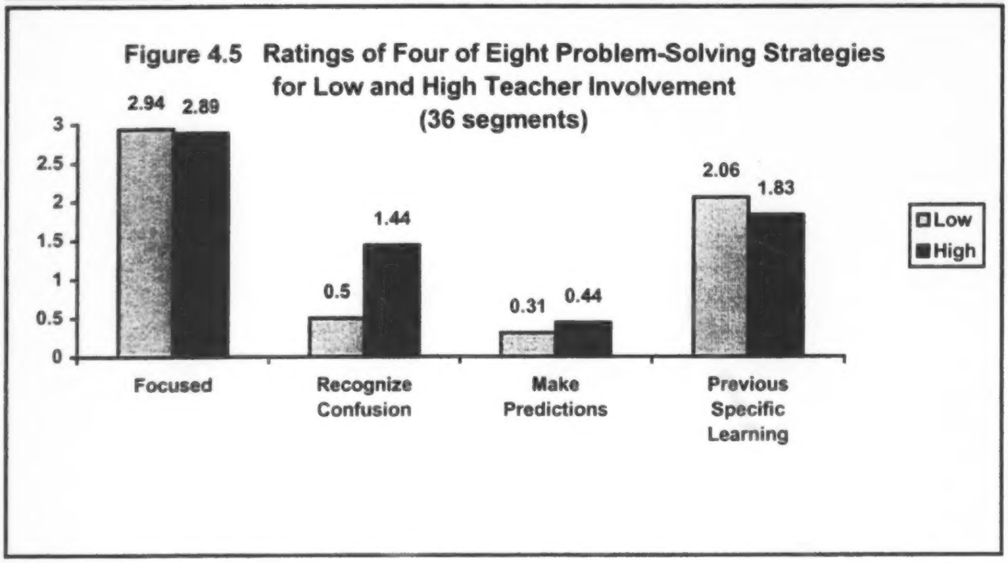


Figure 4.5 Ratings of Four of Eight Problem-Solving Strategies for Low and High Teacher Involvement (36 segments)

Figure 4.6 Ratings of Four of Eight Problem-Solving Strategies for Low and High Teacher Involvement (36 segments)

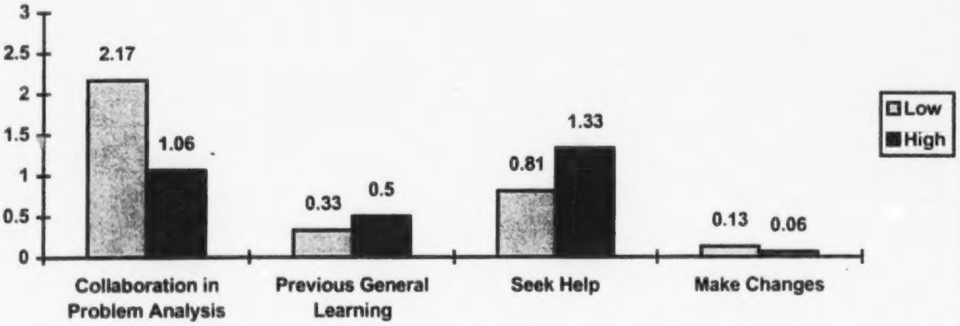
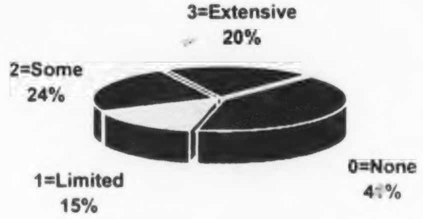


Figure 4.7 Percentage of Ratings for Teacher Involvement (50 segments) (Mean=1.21, S.D.=1.16)



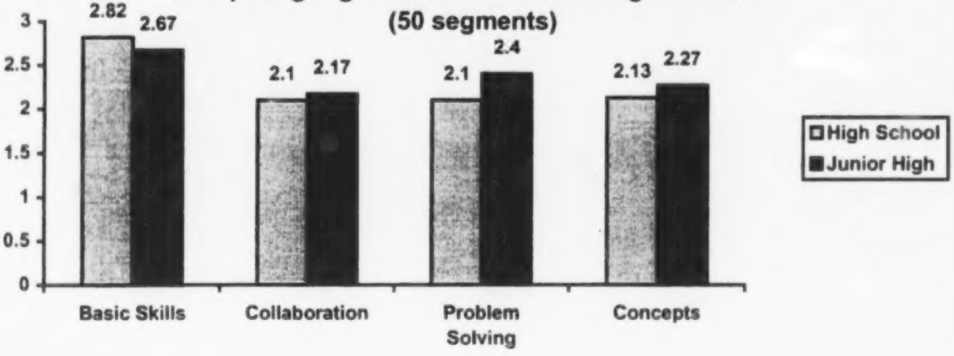
What is the nature of the differences between high school students and junior high students as they do the *Chelsea Bank* scenarios?

A comparison between the junior high and high school students viewed and rated shows only a few distinctions of much interest. Junior high students were rated slightly higher on three of the four general categories, but high school students rated higher on the use of basic skills. (See Table 4.7 and Figure 4.8.) Little can be derived from this analysis, which may suggest that the younger students were a bit more flexible when solving the problems, but the older students were more secure about performing the reading, writing, and math necessary to do so.

Table 4.7 Ratings of the Four General Categories and Eight Problem-Solving Strategies Comparing High School and Junior High Students
(50 segments)

Categories	*High School*	*Junior High*
1. Basic Skills	2.82	2.67
2. Collaboration	2.1	2.17
3. Problem Solving	2.1	2.4
4. Concepts	2.13	2.27
1. Focused on Problem	2.92	2.95
2. Previous Specific Learning	2.07	2.02
3. Previous General Learning	0.55	0.15
4. Make Predictions	0.22	0.65
5. Collaboration	1.93	2.0
6. Recognize Confusion	0.68	1.2
7. Make Changes	0.18	0.17
8. Seek Help	1.0	1.17

Figure 4.8 Ratings of Four General Categories Comparing High School and Junior High Students (50 segments)



As with their inclination to collaborate, learn banking concepts, and focus on the problem, the junior high students tended to practice the problem-solving strategies a bit more than the older students (see Table 4.7 and Figures 4.9 and 4.10). They seemed more ready to recognize when they were confused perhaps because they were less confident in what they were

80

doing and less inhibited about saying, "I don't understand." This may also account for their seeking help more often. The junior high students' stronger tendency to make predictions may be because of their uncertainty about correct responses and their willingness to articulate possible outcomes.

The high school students were clearly more able to apply previous general learning—an understandable result, since they would surely have more experiences to bring to the problem-solving procedures. They were slightly more ready to apply what they had learned from the program (specific learning).

All of these conjectures about differences between high school and junior high students are attempts to explain differences that are, in fact, rather minimal. The major conclusion that can be drawn about this comparison is that the two groups seemed to exhibit very similar behaviors as they worked on the *Chelsea Bank* scenarios.

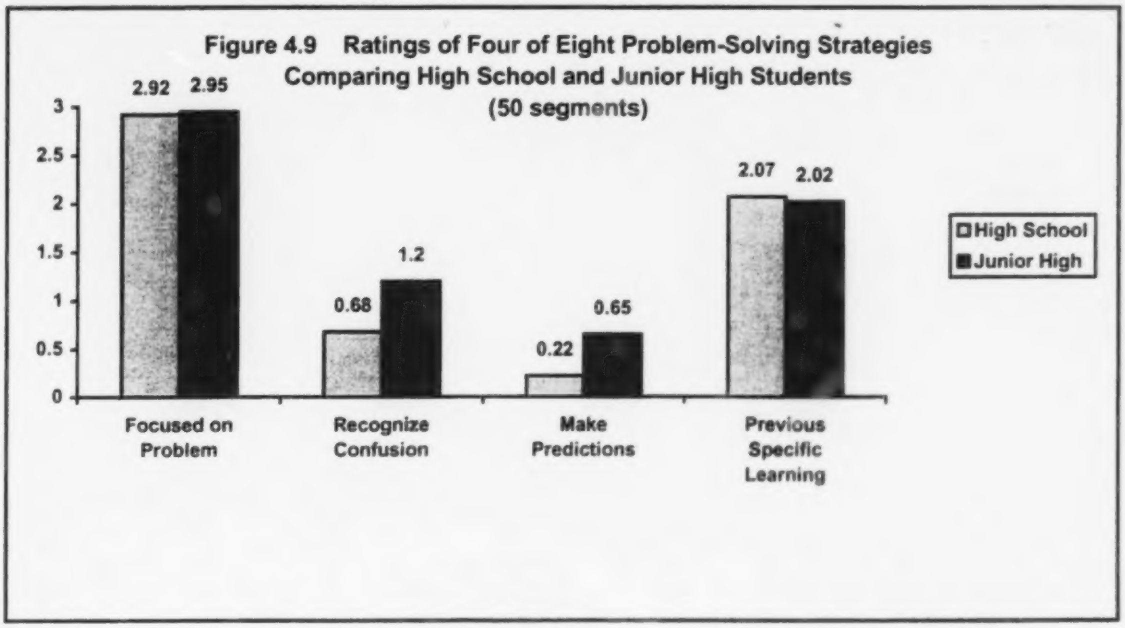


Figure 4.9 Ratings of Four of Eight Problem-Solving Strategies Comparing High School and Junior High Students (50 segments)

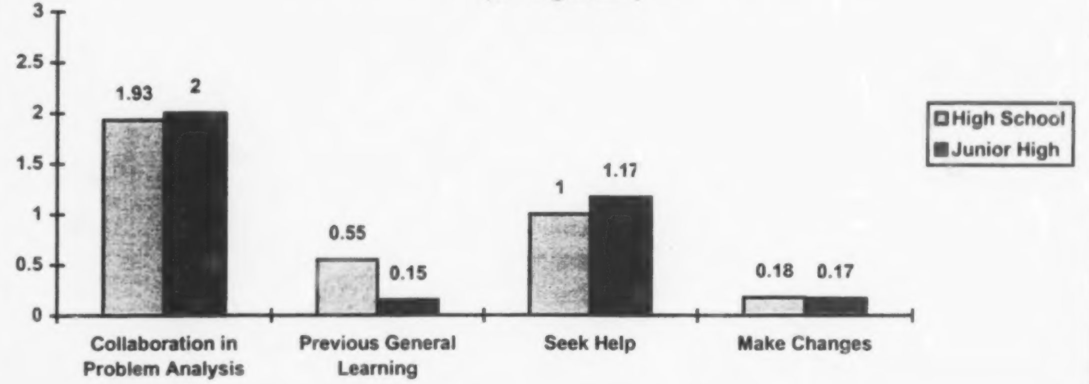


Figure 4.10 Ratings of Four of Eight Problem-Solving Strategies Comparing High School and Junior High Students (50 segments)

What are the differences in student behavior between the first *Chelsea Bank* scenario and a later scenario?

One of the questions that arose during the analysis of the videotape segments was whether there were student behavior differences in different scenarios. We were confident that we did not have adequate video segments for every scenario to do a comparison across all fifteen scenarios. In fact, we did not have any video segments for scenarios 3, 12, 13, and 14. Therefore, a comprehensive comparison was not possible. When the segment selection was completed, we constructed a table (Table 4.2) to determine which scenarios were represented most often among the segments we analyzed.

Table 4.2 indicates that scenarios 1 and 10 were each represented by 10 segments. In addition, the total time for the these two segments was almost 92 minutes for scenario 1 and approximately 68 minutes for scenario 10. It seemed reasonable to subject these two scenarios to a comparison since there was considerable data for each.

So in order to consider the effect of time and experience with the program on student performance, the ratings of viewers were compared for the first scenario in the *Chelsea Bank* series and scenario 10. The means of the ratings for scenario 1 are higher than those for scenario 10. In completing scenario 1, the students were considerably more involved in solving the problem, relied more on basic skills, appeared more attuned [illegible] banking concepts, and were more ready to collaborate (see Table 4.8 and Figure 4.11).

Across the ratings for the eight problem-solving strategies, there were only slight differences in how focused on the problem the students were, in their inclination to make predictions, and in the use of what was learned from the program. The later is perhaps surprising. since by scenario 10 the students had considerably more exposure to banking concepts to apply when arriving at a solution—yet they used that information less. Since the ratings for being focused were relatively high, the difference may not mean a great deal. It was also slight for making predictions, but this is the only strategy where the ratings were higher for the later scenario. There were across the time/experience span, moderate differences in the amount of collaboration on problem solving, the use of previous general learning, and making changes—all with the higher ratings on the earlier scenario (see Table 4.8 and Figures 4.12 and 4.13).

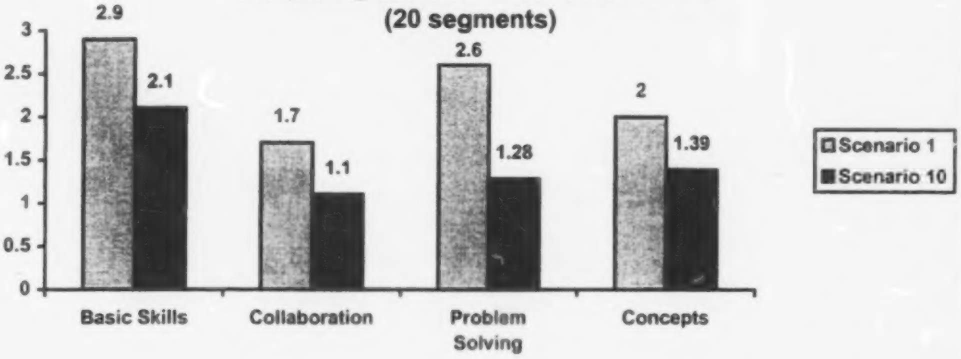
Table 4.8 Ratings of the Four General and Eight Problem-Solving Strategies Comparing Scenario 1 and Scenario 10
(20 segments)

	Scenario One		*Scenario Ten*	
Categories	Mean	S.D.	Mean	S.D.
1. Basic Skills	2.9	.31	2.1	.74
2. Collaboration	1.7	.95	1.1	1.14
3. Problem Solving	2.6	.46	1.28	1.15
4. Concepts	2.0	.53	1.39	.96
1. Focused on Problem	3.0	0	2.78	.36
2. Previous Specific Learning	1.7	.86	1.5	.90
3. Previous General Learning	.60	.81	.22	.36
4. Make Predictions	0	0	0.56	0.17
5. Collaboration	1.50	.94	.94	.88
6. Recognize Confusion	1.55	1.55	.33	.56
7. Make Changes	.25	.42	0	0
8. Seek Help	1.70	1.13	.17	.35

In the first segment, the students were significantly more ready to recognize when they were confused and to seek help. This result was definitely to be expected. But overall, what might explain the higher means for the earlier scenario?

- It may be that scenario 1 has more appeal and is more involving that scenario 10.
- Perhaps by the time that the students have reached scenario 10, they have come to know what to do and their involvement takes on some degree of automaticity. The observation of the viewers is that the simulations are somewhat linear, and if this is so, it would contribute perhaps to a decrease in student commitment and involvement—a drop in intensity might be expected.

Figure 4.11 Ratings of Four General Categories Comparing Scenario 1 and Scenario 10 (20 segments)



- The segments with scenario 1 are shorter in length; thus they may maintain more intensity in terms of student involvement. The teacher is more likely to come into the segment and to perhaps direct and refocus their behavior. Clearly, there was less teacher involvement in scenario 10.
- The higher problem-solving scores on scenario 1 for both the General Categories and the Problem-Solving Strategies analysis may indicate that scenario 1 lends itself more to problem solving as the students face the problem of what do with a customer. Perhaps there is less problem solving involved in scenario 10 when the students have taken on the role of a customer service agent and are concerned primarily with applying bank routines and procedures.
- The higher score on recognizing confusion in scenario 1 may merely be the result of confusion with the routines of the *Chelsea Bank* simulation program and a willingness of the students to express this confusion at this early stage.
- Likewise the lower score on seeking help on scenario 10 may be the result of the students "getting the hang of it" and being able to proceed through the simulation with little need for assistance.
- It is also possible that the students were somewhat complacent with the process by scenario 10 and their interactions were reduced and they were just pushing to get the scenarios completed. The lack of verbalization during the videos would, of course, lower the ratings on all categories.
- It may also be that the groups that were primarily videotaped in scenario 1 were different from the groups videotaped for scenario 10.

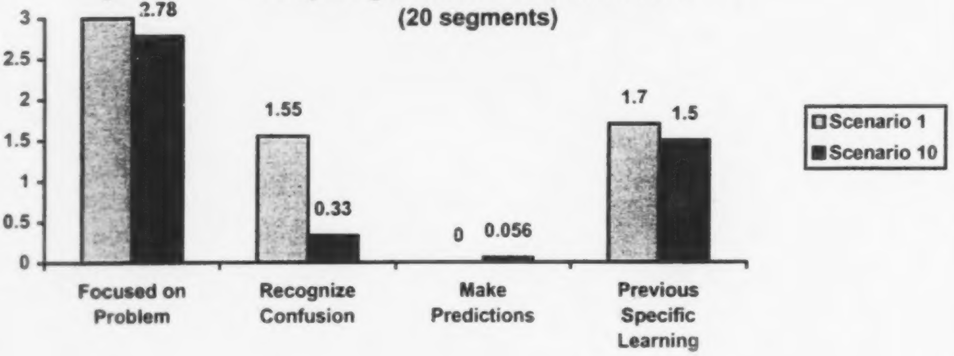


Figure 4.12 Ratings of Four of Eight Problem-Solving Strategies Comparing Scenario 1 and Scenario 10 (20 segments)

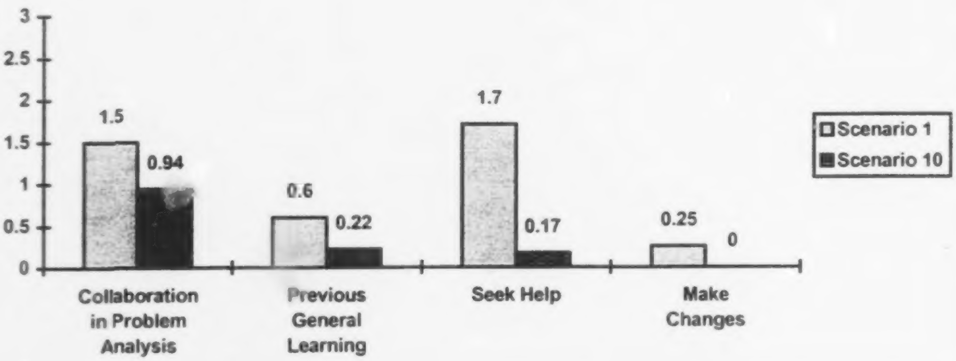


Figure 4.13 Ratings of Four of Eight Problem-Solving Strategies Comparing Scenario 1 and Scenario 10 (20 segments)

Four representative segments show the effect of teacher involvement.

The research team conducted a detailed analysis of 50 segments, which were identified in the *MindWorks* videotapes. The analysis of the student and teacher behaviors in the 50 segments constituted the major quantitative analysis of this part of the study. However, these data may not adequately describe what was commonly observed across these 50 segments. Therefore, the team decided that a set of four segments should be selected to provide a more holistic view of all the tape segments that were studied. The narrative below provides a more qualitative analysis.

The team discussed the selection of the segments and concluded that the single most important factor in determining what the students did as they engaged in the *Chelsea Bank* scenarios was whether the teacher was present or absent as the students performed. Therefore, a three-phase process that emphasized selection of segments based on teacher involvement was followed:

Phase I: This phase entailed the identification of those segments which were rated with high teacher involvement and those with low teacher involvement.

Phase II: This phase entailed the identification of segments with high ratings for the four general categories and eight problem-solving strategies. Thus segments with high teacher involvement and high ratings of categories and strategies, and segments with low teacher involvement and high ratings of categories and strategies were found during this stage. Based on these criteria, eight segments were chosen.

Phase III: During this phase, the eight segments were viewed and analyzed to determine which of them appeared to be the *most representative* of what occurred in a typical *Chelsea Bank* session. Based on this step in the procedure, four representative segments were selected: two segments with high teacher involvement and two segments with low teacher involvement.

Segments #25 and #45 were chosen for several reasons:

- Teacher involvement was rated low;
- All twelve ratings, including those for general categories and for problem-solving strategies, were high;
- Two different scenarios (#8 Mr. Smith and #11 Ms. Austin) were addressed;
- They involved students of different ages (junior high vs. senior high); and
- In addition, these segments demonstrated typical students' interactions when the teacher involvement is low.

Segments #32 and #40 were chosen based on the high teacher involvement and the typical result of that factor: the students are less active in doing the task.

Segment 32	**Scenario Number: 8 (Mr. Smith)**
Teacher involvement: 3	**Length: 10.67 minutes**

Scenario Overview:

This scenario concerns a conflict between a customer and a teller. The customer, who is dressed like a bum, wants to cash a check for $4,000. The problem arises when the teller says that she is not allowed to cash checks for this amount of money without approval from a customer service representative, and the customer complains about the bank service by saying that he is insulted.

Description of Video Segment:

The teacher truly controlled the students throughout the segment. It starts with three students who appear to be hesitant in following procedures. The teacher interrupts and gets them started. She says, "Somebody read aloud so that everybody can listen."

One of the students reads from the screen what the teller reports about the situation. The teacher says, "O.K. Now, let's read what it says at the top, at the yellow bar that you see at the top. And see what it says to do. Somebody read."

One student reads the screen in a low voice and the teacher reads aloud, depicting the scenario situation. Then the teacher explains what the directions say to the students: The directions are to click on parts of the story that the students want to comment on and mark them either true or false. Starting at the beginning of the scenario, the teacher guides the students through parts: "So if you click on one of the lines....if you agree, you would click what?"

One of the students answers, "True."

The teacher asks again, "If you didn't agree, you would click what?"

"False," replies a student.

The teacher goes on: "I think what you should do is to read what they are saying and pick true or false and tag it. Go through the lines and I want you to read each person—the customer and the employee."

As the students are reading a line, the teacher asks if the statement is true, and one student replies yes. Then, the teacher—without asking the students why they think it is true or if there is an alternative to that answer—tells them to tag true. The teacher directs, "Hit it again. Hit it in the middle. Bring it up."

They work their way through the scenario, a statement at a time, and then review the teller's and then the customer's perspectives—marking what the students feel is true or false. This takes up all but about a minute of the segment.

At the end of the segment, one student finally raises a question by saying, "The customer wants to cash a check for $ 4,000. That's the problem. Is that a comment?" The teacher does not answer the student's question, pressing for an answer for her own question: "Now, who do you think is right in here?"

Ratings for Segment 32

- **Teacher involvement: 3**

General Categories

- **Use of Basic Skills: 1.5**
- **Collaboration: 1**
- **Problem Solving: 1**
- **Use of Banking Concepts: 1**

Problem-Solving Strategies

- **Focused on the Problem: 3**
- **Recognize Confusion: 1.5**
- **Make Predictions: 0**
- **Previous Specific Learning: 1.5**
- **Collaborate in Problem Analysis: 1**
- **Previous General Learning: 0**
- **Seek Help: 0.5**
- **Make Changes: 0**

Analysis:

Feeling the need to get through the details of the scenario and to train the students to use the true-false tagging tool, the teacher is unable to leave room for the students to collaborate or to exercise problem-solving strategies. She is quick to direct the students in the activity. We do not know whether or not the teacher felt that these particular students needed extra help in the form of these rather explicit directions through each detail of the scenario; nor can we be certain exactly how the exercise ended, since the taping is cut short.

At the beginning of the segment, the students' facial expressions and relative silence suggest that they do not know what to do with the given task in the Mr. Smith scenario, which is scenario 10 and is relatively advanced. It is not clear whether they called for the teacher's help or she saw that they were perplexed and came to help. Perhaps she was instructed before the taping to stay with the students all along. Whatever the reason is, the teacher in this segment seems focused on providing students with mechanical directions so that they can advance through the scenario lesson.

The table above shows the average scores for the four categories and eight strategies across this segment. As can be seen, when teacher involvement is high, the scores for most of the twelve factors are low. It seems that the score for the category *Focused on the Problem* is high because of the high teacher involvement. Since the teacher gives directions on what to do, the students are not distracted, and proceed, using the true-false marking tool to assist their decision making.

Segment 40

Scenario Number: 8 (Mr. Smith)

Teacher involvement: 3

Length: 4.97 minutes

Scenario Overview:

This scenario concerns a conflict between a customer and a teller. The customer, who is dressed like a bum, wants to cash a check for $4,000. The problem arises when the teller says that she is not allowed to cash checks for this amount of money without approval from a customer service representative, and the customer complains about the bank service by saying that he is insulted.

Description of Video Segment:

The segment begins with the teacher asking a question. He asks the students if they know what to do with the screen. With negative responses from the students, he explains how to narrow down a choice:

"What you can do is to highlight parts of it....If you highlight over there....Just click on it....You can highlight parts of the story. What you can do is, you can either put it as true or false, or you can make a comment about it."

After giving a mechanical direction, the teacher probes for student involvement by asking many questions, such as, "What seems to be the problem? What's your job? Why did they (the angry customer and the distraught teller) come to you (the service representative)?" and so on. Each time he asks questions, the students answer them:

Teacher: O.K. Here you are presented with two sides. You hear two sides (the customer and the teller). What are you going to do?

Student 1: We go to the manual and check it out on the good banking procedures.

Student 2: We would know that she is telling the truth because she is not allowed to cash checks for more than 2,000 dollars. We know that part is true.

Teacher: (Looking at Student 1) You brought up another issue. You said you have to calm the customer down. Why does the customer have to be calmed down?

Student 1: (does not answer)

Student 2: Because he is angry with the service that we gave him. He said that the way we treated him was insulting and stuff.

Teacher: O.K. That's the second issue that you are also going to have to deal with here. O.K.? Where do we go from here?

Ratings for Segment 40

◆**Teacher involvement: 3**

General Categories

- ◆ **Use of Basic Skills: 1**
- ◆ **Collaboration: 0**
- ◆ **Problem Solving: 1**
- ◆ **Use of Banking Concepts: 1.5**

Problem-Solving Strategies

- ◆ **Focused on Problem: 2.5**
- ◆ **Recognize Confusion: 1**
- ◆ **Make Predictions: 0**
- ◆ **Previous Specific Learning: 2**
- ◆ **Collaborate in Problem Analysis: 0**
- ◆ **Previous General Learning: 0**
- ◆ **Seek Help: 1**
- ◆ **Make Changes: 0**

Analysis:

While the teacher seems to ask useful questions to help the students get through this lesson, his assistance does not leave much room for them to discuss among themselves and collaborate. The ratings for collaboration and problem solving were very low, 0 and 1. For instance, even though the teacher's last question ("Where do we go from here?") seems to be a useful one, it would have been more desirable if the students had come up with the same question by themselves.

High teacher involvement also does not seem to allow leadership to emerge among students. For example, compared to segments involving further consideration of this same scenario and with these students but with lower teacher involvement, the students do collaborate some. The teacher is still present, it appears, and much that the students say is in response to him; but the teacher intercedes less often and the team does make entries as a unit and comes to a decision with some collaboration. The boy in the center, who is silent in the earlier segment on this lesson, begins to talk about the problem a bit.

When student teams are left more to their own devices, they appear more readily to work together to solve a problem by asking questions of each other and by thus exchanging information. In one such segment, one boy exemplifies individuals in other groups by emerging as a leader, suggesting that when more dependent on themselves, someone in a student group assumes a leadership role. In the present segment, however, it is observed that none of the team members does this. The one boy sits back and says almost nothing, not even responding to the teacher's questions.

In short, when the teacher is highly involved, not all students are involved to a significant degree, there is little collaboration among students, and leadership is not developed.

Segment 25

Scenario Number: 8 (Mr. Smith)

Teacher involvement: 0

Δ Length: 8.35 minutes

Scenario Overview:

This scenario concerns a conflict between a customer and a teller. The customer, who is dressed like a bum, wants to cash a check for $4,000. The problem arises when the teller says that she is not allowed to cash checks for this amount of money without approval from a customer service representative, and the customer complains about the bank service by saying that he is insulted.

Description of Video Segment:

This segment deals with a customer named John Smith who wants to cash a check.. However, Mr. Smith does not have any type of identification and looks like a bum. The three students refer to the manual to determine the procedures which apply to a customer, who does not possess an ID. The three students discuss which choice to make based on what the manual says. They are confused because the manual does not direct them to a clear decision. Thus they try to make a decision by eliminating two choices and continue to discuss the other options:

Student 2: "You don't have any proof that he's a bum."

Student 3: "But he doesn't have an ID. I wouldn't cash the check."

Student 1: "Why wouldn't you cash it?"

Student 3: "I wouldn't cash the check because first of all he doesn't have an ID and second no one has seen him before."

The students are also shown discussing the consequences of their choices—some, as one member points out—after they have already decided to cash the check. In the conclusion of the scenario, they are delighted to learn that they have made the right decision—that the bum is a bank executive testing what would happen to a homeless person with no ID who had a legitimate check to cash. At the end of the segment, the students are a bit disappointed because they expected to get a promotion for not making a "bum" decision but the screen tells them that didn't happen.

Ratings for Segment 25

- **Teacher involvement: 0**

General Categories

- **Use of Basic Skills: 3**
- **Collaboration: 3**
- **Problem Solving: 3**
- **Use of Banking Concepts: 3**

Problem-Solving Strategies

- **Focused on Problem: 3**
- **Recognize Confusion: 0**
- **Make Predictions: 1.5**
- **Previous Specific Learning: 2.5**
- **Collaborate in Problem Analysis: 3**
- **Previous General Learning: 1**
- **Seek Help: 1**
- **Make Changes: 0**

Analysis:

Collaboration as a general category and as a problem-solving strategy is high throughout this segment with a rating of 3. It is observed as students are shown consistently interacting with one another. In addition, the students are shown taking turns in performing mechanical procedures (*i.e.*, with the mouse and using the keyboard to write onto the screen). This segment is typical of what occurs when the teacher is not present for a sustained amount of time. During teacher absence, often students are highly focused, exchange their thoughts and perspectives in open collaboration, and demonstrate critical thinking skills. Furthermore, it is common to find a student taking a leadership role when the teacher is absent as one student does here.

Segment 45

Scenario Number: 11 (Ms. Austin)

Teacher involvement: 0

Length: 11.05 minutes

Scenario Overview:

This scenario concerns a young woman in her 20's who would like the customer service representative to approve her car loan.

Description of Video Segment:

This segment begins with students discussing what they should do. It appears that the students are not sure if they should approve the car loan to Ms. Austen. Thus, they look at the rules in the manual.

Student 1: She has a little bit of money in the bank....

Student 2: Let's check the manual to find out if there is any special rule we have to go by.

One of the students clicks on the customer service icon. The other student reads a list of rules. However, they cannot find the rule they want.

They are shown discussing what should be their final decision. All three of them are working together and discussing actively each of their possibilities:

Student 1: O.K. She is a reliable person, which is true. She is responsible for financial matters.

Student 2: What do you think?

Cautiously, they consider the problem and how their decision could affect the bank:

Student 2: O.K. Let's go to the report.

Student 1: (Reads the screen) Define the problem.

Student 2: (Writes) There is every reason to believe Ms. Austen is a reliable person....

At the end, they all agree that they should make the loan. It turns out, in the scenario discussion that this is a good decision. A highly successful person over the years, Ms. Austen never deserts the bank that put its trust in her.

Ratings for Segment 45

◆Teacher involvement: 0

General Categories

- **Use of Basic Skills: 3**
- **Collaboration: 3**
- **Problem Solving: 3**
- **Use of Banking Concepts: 3**

Problem-Solving Strategies

- **Focused on Problem: 3**
- **Recognize Confusion: 0**
- **Make Predictions: 1.5**
- **Previous Specific Learning: 2**
- **Collaborate in Problem Analysis: 3**
- **Previous General Learning: 0**
- **Make Changes: 0**

Analysis:

The three students are extremely focused as they collaborate with one another in trying to solve the problem. Their previous specific learning is demonstrated significantly as the students refer to previous information that they have learned and utilized in the prior scenarios. Since this is one of the last scenarios students experience in the class, it is common to have some categories rated low. For instance, make predictions, recognize confusion, and seek help tend to be rated low as the students at this point have become familiarize with overall procedures and how the specific information they have picked up applies.

How clearly is an assessment component needed?

As we studied the *Chelsea Bank* program, the need for an assessment component became increasingly clear. As we synthesized our analysis of 50 segments of student performance during the *Chelsea* presentations, our interviews with teachers and students in the program, and the analysis of the scenario lessons themselves, we determined that an effective assessment package could help both teachers and students recognize and focus on potential outcomes, increasing its ability to develop the skills, interpersonal behaviors, and other strategies that the study identified and defined. A good assessment package can also allow educators to hold the program accountable to its objectives while it serves as an impetus to school reform.

It became obvious to us that for this to happen, both the students and teachers participating in it would need a clearer, firmer grasp on the goals and objectives they hope to achieve with the program. While the students, teachers, and other school personnel involved in the program were often enthusiastic about it and could cite some outcomes they expected from it, many of them did not have a cohesive grasp of what its goals are or should be.

Our observations of the major category *Collaboration* and its more specific application as a problem-solving strategy illuminate this point most effectively. We verified that students' effectiveness in identifying and solving problems relied directly on their inclination to collaborate. When the members of a student team discussed among themselves the details of a scenario and the potential impact of a decision option, their behavior led more directly to an appropriate solution. Even when they were confused, collaboration helped student teams to recognize that fact and to decide where to go for information or other help.

In the interviews conducted, students seemed to have a variety of conceptions as to what the program was achieving. Most commented on the real-world nature of the simulations, some detailing that they were learning some banking skills, the importance of following proscribed procedures and regulations, and how to get along with people. Some students recognized the importance of collaboration and noted that the program promoted it; but an equal number also bemoaned the need to consult with teammates about what they would do about the situations presented in the scenarios. Clearly, there was not an appropriate focus on collaboration among all of the students participating in the *Chelsea* experience.

Nearly all of the teachers interviewed commented about the program's potential to develop collaboration, but interestingly they were not often involved in promoting it. For example, when students decided that they were confused, they frequently turned to the teacher for help and from that point on, student collaboration was replaced by exchanges between the teacher and one student at a time. So while some students recognized that learning to discuss problems, issues, and options was a key lesson of the *Chelsea Bank* experience, that did not insure that they consistently demonstrated the strategy.

Teachers were unsure at times as to how to guide their students when they needed assistance. Their monitoring usually consisted of helping the students continue through the scenario. Frequently teacher assistance directed students to the decision-making tools available within the program, but this assistance did not appear to be promoting team interaction as responses to teacher questioning and explanations. Turning back to the process of marking statements in the scenario as *true* or *false*, for example, sometimes ultimately led to resumed student collaboration; but most often, progress bogged down, awaiting the student interaction.

The interviews with teachers suggest that they understand that developing student collaboration and teamwork is one of the program's greatest potentials, but their recognition of that goal does not appear to be focused enough to direct instruction that will promote it. Rather, one of the major conclusions drawn from the observations was that student collaboration flourished in direct proportion to the absence of teacher input.

Teachers who will be using the program will not have the potential to videotape their classroom as the program is administered and cannot be expected to analyze such data to recognize if it is achieving its goals. *An effective assessment component, however, can enable them to determine if the* Chelsea Bank *program is indeed developing collaborative behavior among their students*. It will direct a focus on this and the other goals and objectives that the study has identified for the program, and this will effect both instruction and student responses to it, while revealing its effectiveness in their classrooms.

Our study revealed that while some teachers were aware of this and other goals of the program, most were not sure of its multiple potentials. Our analyses of the taped segments of the program in use reinforced our identification of all four major categories as program goals and of the eight strategies that appear reasonable and important in identifying and solving the problems arising from the banking scenarios. Some of them were more evident in the student behaviors than others. The need for some was underlined both by their presence in student performance and by their absence. Some were rarely seen but of apparent potential. Assessments can be developed to ensure that teachers and students focus on these potential outcomes.

Several teachers who were interviewed noted that assessment is an important component that is missing from the program. They knew that their students were engaged and interested and that they were completing the simulation lessons, but they seemed unsure of just what the students were learning. A few developed their own assessments—usually tests covering banking concepts. They often expressed their need for the information that it would provide them in terms of particular content and behavioral goals that are discussed in the following section of this report as factors that relate to designing an assessment component for the *Chelsea Bank* program.

After examining the entire program, carefully observing students and teachers using it, and interviewing teachers and students, we continue to be impressed by the intensity with which the students engaged in the simulations. However, if this program and/or the approaches on which it is based are to be adopted, decision makers will not be able to invest the time and focus to examine the program as we have done. They will want assessment data that reflect what their students are getting from it as well as information that will assist teachers and students in getting the most out of it.

What kind of assessment may be designed?

While noting the need for an assessment component during our study of the *Chelsea Bank* program, we were able to identify the purposes that it should serve; and we were able to consider the kinds of assessments that would serve those purposes and what the content and structure of the assessments might be.

It has been determined that assessment must first serve to focus the simulation materials on expected outcomes so that teachers and students alike can have a clear grasp of the potential benefits of using the program. Assessment will need to reveal how well students perform, indicating how readily and how effectively the students collaborate, how well they apply various strategies to solving problems and making decisions, how well their command of basic skills serve that application, and to what degree they have gained a command of banking concepts.

It seems clear that the *Chelsea Bank* assessment will need to report on *the processes* the program involves and nurtures, not just to test the retention of terms and information. Our analyses revealed that the assessments developed should have multiple purposes, serving multiple audiences. This will require measures and approaches that can be used at different times in the program.

Three major and over-riding emphases of these assessments will need to answer these questions:

- Do the learners grasp basic information and concepts presented during the *Chelsea* experience? (The assessment will need to measure knowledge gained.)
- Are the learners able to apply what they have learned to solve other problems? (The assessment will need to examine how well the program has met its goals *in application.)*
- Are the learners able and inclined to assess their own skills, behavior, and progress? (The assessment component will need to include aspects that will model and develop the student's tendency and ability to self-assess.)

The assessment component must meet the needs of three major audiences:

- *It must serve the students*, focusing the goals of the program as expectations of its potential. It must provide indicators to the students both of what they are learning and how they are developing and of how they can learn more—become more effective thinkers and problem solvers, know more about banking, and develop and apply their basic skills to similar tasks. At the same time, assessment must involve the students in monitoring and analyzing their own progress while modeling approaches and methods for doing that.
- *It must serve teachers*. It should not only indicate to teachers *whether* the students are learning, but also *how* they are learning. Teachers want and need to understand the processes that students are using effectively and which need development and practice. The assessment component should indicate directions and emphases for other instruction and classroom experiences.
- *It must inform decision makers*. The *Chelsea Bank* assessment needs to account for how well the program is achieving its goals with the particular groups of students using it. Assessment should reveal the program's impact or lack of it.

Assessing for the *Chelsea Bank* program should take place at various points during the use of the lessons:

- Needs assessment should serve the preparation and planning of the *Chelsea* instruction, both related to and growing out of the *Chelsea* scenarios, and this same aspect of the assessment component can serve as a baseline for assessing growth.
- Assessment needs to enable the monitoring of student progress, in effective strategy use, for example, as the series of *Chelsea* lessons progresses.
- A summative facet of the assessment package must report on the accomplishment of program goals when the lessons are completed.

These three general emphases create a kind of dimensional approach to designing the assessment component by allowing the research team to consider how these three considerations interrelate and interact. For example, in a structured model of the three-dimensional approach, the cell that places the focus on the self-assessment of students to monitor their own performance suggests the possibility of informal checklists with questions about both what they know and how they are performing. Such tools in an assessment package might well be overlooked without this type of a planning approach. This is but one example of how the matrix will promote considerations about the types, content, and structure of elements of the assessment package.

Obviously, the designing of the assessments will rely heavily on the awareness of the program developed during the first-year study. What we learned from the analysis of the lessons, the observation and analysis of the students' performance on the videotapes, and the teacher and student reactions and suggestions gained from the interviews will help guide these complex considerations.

The eight strategies that were articulated for studying the main category of problem solving will figure in the assessment of what students learn from the *Chelsea* experience. The performance perspective will surely involve some report on how the student's command of basic skills affects his or her problem-solving ability. It is yet to be decided how the students' grasp of banking concepts will be assessed—with a kind of test, as some submeasure within a performance assessment, or in some design that combines the two.

But while the twelve considerations that structured the analysis of the tapes guided the team's grasp of the program, they may not form or dictate the primary structure of the analysis. The consideration of how the program can best be assessed began and continued during the different analyses and are a major activity bridging the efforts of year 1 and year 2 of the overall study.

The interviews demonstrated the complexity of the considerations, and as they struggled for a firmer grasp of the goals of a program they found so involving, both teachers and students contributed to rich vein of possibilities. One teacher recommended a traditional form of testing to find out what the students are learning; another suggested that assessment might grow out of her approach of listening to student conversations to find out when they are having problems. Other teachers recommended content emphases, including math and banking concepts.

A student, who thought the student groups should get a "group grade," noted that there were no tests but that "Every day was a test for me—we had to do new things." Another student recommended both individual and group tests.

The range of one teacher's suggestions suggests the need to be open in considering what assessment can be developed:

> "If I were to design a test for [the] simulations, it would [cover]…math skills; [banking concepts like] what is a 'good check' and procedures for doing things in a bank; [and] personal matters. I [would want to know] if I gave them a problem (not [necessarily] workplace), could they solve it? What kind of problem [could they solve]? I would test them individually to see what each student got out of it. No group assessment. I think they should be tested on ethical issues. They need to follow procedures and [to] run an ethical business….I would…develop team portfolios."

Some of this teacher's input is reinforced and enlarged by that of another:

> "If I [were] to develop a test for the simulation, it would present new bank problems to determine how students might solve [them]. I think [we] would need both individual and group tests to see if students [have] learned to work together and to see if they [have] individually learned new concepts. The assessment should definitely be administered on a computer."

These excerpts of interview data indicate the scope of the considerations that will initially frame efforts to design the assessments. Our understanding of the program has grown with ongoing analysis of the lessons, scenarios, and the response of students and teachers to them. The results of this effort will be directive as the assessments are designed, tried out, and perfected during the second and third years of the project.

The experience has led to ongoing brainstorming among members of the research team with a host of relevant but unrestrained ideas that exist in notes and our minds as considerations to be discussed and considered. Just a few of the ideas that they include are:

- Experiment with having the participants do some kind of "process writing" as they solve problems so that it can be analyzed using some "large-scale" assessment of the strategies the student is aware of and using, the problems that the student has encountered, the number of banking concepts that are understood and used correctly, etc.
- Have the student record reactions to the lessons and respond to questionnaires or other checklists and self-analysis ratings that make up a kind of job-preparation portfolio.
- It seems reasonable that the assessment environment should allow and even require collaboration and be administered in a setting that encourages it. We must consider the possibility that all—or a significant part—of the assessment will need to be administered to teams, as opposed to, or in addition to, individuals.
- A part of the assessment package can assist, guide, and promote meaningful teacher observation that can be correlated to analytical suggestions about what different things seen may mean in terms of student development.
- While a test of (or assessment involving) banking concepts would need to rely on those that the program has presented, it might introduce one or more new ones that can be understood in an inferential way if one has a grasp of some others that were presented in the scenarios.
- Like a few of the scenarios, an assessment problem/scenario might not be resolved by finding a particular guideline in some tool or even by combining two or more bits of available information. It might involve considerations that force collaboration as to a judgment call. If this is tried, it seems reasonable that there not be one "correct" response or solution; this part of the assessment would focus on the process/behavior of the student.
- The solutions of the problems need not always be presented as multiple-choice options as in the scenario lessons, This might be a more difficult, but better, test of decision-making, problem-solving behavior the student has developed.
- One or two scenarios might be targeted as "open-ended" in which the student writes one decision and/or several possible outcomes.
- The team should be fed some results or information in a step preliminary to the final resolution, so it has an opportunity to *change* its decision or to add an option to possible solutions. Perhaps this could be done in a scenario as an intermediate supervisor's

recommendation. This would turn an aspect of the scenarios that the students seemed to enjoy a great deal, but it would make it instrumental to a test of particular strategies—making changes/seeking help—that they might use.

- There should also be some intermediary feedback that follows some incentive/motivation that requires the student to make a *prediction*, which could be followed by an opportunity to make changes based on that feedback.
- A similar intermediary step should allow students a chance to articulate/*recognize confusion* and to let them *seek help* by specifying a particular information source. This would help teachers target needed instructional intervention.
- Many of these ideas suggest that a major portion of the assessment should be presented in steps/stages/sequenced events interlaced with feedback or the presentation of additional information about the scenario not available until then.
- Using the tools must be considered an important type of seeking help. Otherwise that strategy is going to over-encourage reliance on the teacher. The teacher's role must be specified in some aspects of the assessment.
- To test keeping a *focus on the problem*, some attractively distracting element can be incorporated in one or more scenarios.
- The students could be required to keep portfolios in which they keep notes about problems, reactions, etc. An ongoing account of the experience could be included. Students could be provided materials to provoke and guide several perspectives in self-assessment. It could include some scenario extensions coded to responses and handed out by the teacher after decisions are made—similar to the promotions, compliments, criticisms they got with the scenarios. This would be some solution to the need for individual assessment within a component that administered some aspects to teams.
- The students could be required to keep journals of their experience with the program. Some very general guidelines could suggest comments about the student's relationship with other team members, matters that seem confusing or unresolved, etc. These journals might be kept in a portfolio common to the team.
- The members of a team could keep a response journal in which they get a chance to review and elaborate on interaction in collaboration. This might also incorporate a way to record any increasing reliance on the strategies *recognize confusion, seek help, make changes*.
- All of these possibilities involving open writing, portfolios, and journals would be most effective if the teacher were provided with some suggestions and help in interpreting entries.
- If a part of the assessment were administered on computers, the students could be allowed to ask questions to be answered by a file like that usually called "Help" in most software. It could have a search capacity that picked up on key words in questions typed in.
- A test of banking terms might involve some options that attempt to appear like application.

- A test could also give the student a list of information sources/tools and then several problems/questions, requiring the student to indicate where s/he would go for an answer.
- Some assessment items or scenarios should place the student in the position of supervisor and require him/her to react to the performance of some teller or junior loan officer.

These are *merely a few jot-note type ideas* that indicate the rich pot of considerations to be reviewed early in the process as the development of the assessment begins. It is probable that a broader array of assessment tools may be in the development stage early in the process before the final mix and assessment component package begins to take shape to be fully designed for the tryout stage.

V. Teacher-Student Interactions During the Simulations

Simulations like *Chelsea Bank* significantly impact the role of the teacher in the learning environment. Simulations place the learner in the role of decision maker and problem solver. The content to be learned is encountered in the process of problem solving. Thus the role of the teacher can no longer be that of presenter of information. Instead the teacher must work with the students as a coach or guide, supporting their problem-solving skills. But it is not clear how teachers should coach. The Teachers Guide accompanying *Chelsea Bank* does not give the teachers any guidance as to what they should do while the students are working on the simulation. Further, as we noted earlier in this report, there is not much experience in using simulations in the school environment and therefore there are not standards of practice available in the literature.

Given this context, we sought to understand how teachers using the program interacted with their students. We identified three models of coaching. First, there is the "stay out of the way" coach. In this coaching style the teacher focuses on getting the students started with the problem, motivating them, and then getting out of the way. There is very little student-teacher interaction once work begins. The second model of coaching is the teacher-centered model. In this model, the coach tells the students what to do. This coach will remind the students of the "correct procedure" and tell them how they should proceed. Such a coach will also observe the learners to make sure they are doing it "right." The final coaching model is the learner-centered model in which the coach asks the students questions and challenges their thinking. The support is based on, and arises from, the student's thinking.

These three models can be distinguished by two criteria: the stimulus for interacting with the students and the pattern of information exchange. The coach who stays out of the way will only interact with the students when called upon, while the other coaching styles will include unsolicited interactions. However, the learning- and teacher-centered coaches can be distinguished by the directiveness of the teachers' comments to the students.

The goal of the research reported here was to examine the student-teacher interactions with regard to the frequency, stimulus for, length, and nature of the interaction. From these data, we seek to infer the coaching strategy of the teachers.

Method: How was the data for this analysis collected?

In this section of the report we turn to the new classroom data, i.e., the classrooms where we worked with the teachers and Classroom Inc. to collect video records. Four high schools (EBC, Salesian, Jefferson, and King) participated in this data-collection effort. Each high school submitted tapes of students working on scenarios 3, 8, and 11. A total of six classes were represented on the 15 video tapes which provide approximately eight hours of footage combined. Each student-teacher interaction was logged and evaluated.

Several if not all of the teachers are engaged with the student groups before and after the scenarios. While this is relevant to the analysis of coaching strategies, our video record is limited to the actual time the students were working on the scenario, and therefore our analysis is limited to the actual time students are working on the scenario.

Findings: What did we learn about student-teacher interaction?

The results of the study depict teacher-student interaction with quantitative analysis and qualitative description:

The quantitative analysis does not reveal high frequency.

Table 5.1 presents the frequency of teacher-student interaction during the scenario at each of the schools. Across the 18 *Chelsea Bank* scenarios there were only 34 instances of the teacher talking to the group. The student-initiated interactions tended to be cases where the students would ask a question such as, "Can you make a check out to cash?" or "How do you spell Rodriguez?" In most cases, the teacher answered the student and moved on to another group. The teacher-initiated discussions were generally orders being given by the teachers about the way a scenario should be solved. The "other" category included both disciplinary (e.g., the teacher telling the students to get back to work) and interactions that had nothing to do with the scenario or the students work on the scenario (e.g., discussion of other projects.)

Table 5.1 Types of Teacher Interactions with Students

	Instructional		*Other*	
Schools	Student-initiated	Teacher-initiated		Totals
Jefferson (2)	7	2	1	10
EBC (2)	1	0	2	3
King	6	2	1	9
Salesian	8	3	1	12
Totals	22	7	5	34

Twenty-nine of the thirty-four interactions were instructionally based. Thus, the teacher only approached a group for instructional purposes 1.6 times per scenario. The median[1] length of the interactions is only 23 seconds. Therefore, the teacher interacted instructionally with the students an average of 38 seconds per scenario, whereas the scenarios generally took 35 to 40 minutes to complete.

Of the twenty-nine instructionally motivated student-teacher interactions, only seven were initiated by the teacher, an average of one visit per 2.6 scenarios. There was variation across teachers: The teacher at Salesian initiated an instructional interaction once per scenario, while the other teachers initiated an instructional discussion once or never during the three scenarios. These data suggest very strongly that the dominant model of guide is to "stay out of the way." There is little, none in one case, instructional monitoring by the teacher.

We next looked at how the teacher responded to the student's request for information. In most of these twenty-two instances the teacher was asked a question that the students could have answered on their own with some guidance. However, in most cases (77%) the teacher provided an efficient response and moved on. Only five cases out of the twenty-two student-initiated interactions (23% of the cases) involved the teacher providing an opportunity for the students to grow and learn from their question. The "Other" category in Table 2 reflects instances where the teacher either did not respond to the student's question or responded by asking a question such as, "What did you pick?" and walking away.

Table 5.2 Teacher Behavior in Student-Initiated Interactions

	Directed/ provided information	*Guided*	*Other*
Jefferson	5	2	0
EBC	0	1	0
King	2	1	3
Salesian	6	1	1
Total	13	5	4

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[1] We report the median here because the scores are skewed in part due to a basement effect but also due to one extreme outlier -- a 10 minute interaction with the students. The mean length of the interaction was 57 sec.

In summary, the teachers tend to stay out of the way while the students work on a scenario. However, when they do interact with the students, they tend to be guided by the teacher-centered model. When teachers are initiating an interaction, it is usually to give instructions to the students. When the interaction is student-initiated, the teacher typically responds by simply providing the requested interaction. When they don t just provide information, teachers are almost as likely to ignore the question (the "other" category) as they are to engage the students in a learning dialogue.

A qualitative description depicts the nature of the interaction.

The description in the previous section provides data that suggests that teachers tended to be directive in their interactions with students. In this section, we attempt to provide a richer flavor of the nature of that interaction. In the following pages there are summaries of the interactions in each of the four schools sequenced from the site that was most learner-centered to the site that was most teacher-centered in terms of the pattern of interaction.

Each section begins with a discussion of the teacher's style with examples of that style. We then present a sample of interactions chosen because they represented typical interactions for that teacher. The scenario descriptions are preceded by a number that refers to the *Chelsea* scenario. In cases where more than one class was used at a school, the class number is also provided before the description. (For instance, "3.2" means *Chelsea* scenario number 3, second class for the teacher.)

King High School. The teacher at King High School showed the most evolution during the course of the three scenarios. In the early scenarios, she used the step-aside approach almost exclusively. By scenario 11, however, she had evolved to a learner-centered approach. She stimulated the students' thinking with hard questions and encouraged them to discuss their ideas even when she knew that they were "wrong" according to the answers provided in the scenario.

In the most impressive discussion from any of the video records, the teacher at King tries to help the students express their thoughts and understand where they made their errors. It occurs after the students have called the teacher over because she told them to let her know before they answered the discussion questions in the simulation. (In the transcript, T= teacher and S = any of the group members)

T: What was your reason for picking C?
S: She's young; she wants a sports car even though she wrecked two in high school.
T: What do you think, Antoine?
S: Yes.
T: Why?
S: Like my partner said, she's young, when in high schools, she hit two cars.
T: Do you want to go with C also?
S: Yep.

T: Why?
S: She's about 22. She asked for over $10,000, and she may not even be over 20.
T: There were two right answers.
S: C & D—watch!
T: One was A.
S: See I told you....
T: You said you agreed with C.
S: I said A before we even did this.
T: What do you think the other one [correct answer] was?
S: D.
T: Why do you think that it was D?
S: Did we pick the right answer? Yes or no?
T: Why do you think it was D? Do you know what D was? (Reads part of D to students)
S: She's young—she still seems wild.
T: So, do you think it's D?
S: No, I still say its C.
T: Antoine?
S: What's the two right answers?
T: A and B.
S: What?
T: (Reads A, then reads B) Do you think Ms. Austin's age should have been a factor into the decision about this loan?
S: In a way.
T: Why should it be a problem?
S: We don't know her age. She doesn't have much experience.
T: Did you check out her finances?
S: Yes.
T: Did she have money in the bank?
S: She has $880 now.
T: What do you think, Gerome? Should her age be considered?
S: Yep.
T: Why?
S: The girl looked young.
T: So why should that enter into whether you give her a loan or not?
S: It interferes—she can pay it, but how do we know if we can trust her or not?
T: Well, if she was 40 years old and had the same account, it would have been all right?"
S: The point is that she had two cars and she trashed them.
T: Do you think its appropriate to ask if she ever owned a car before?
S: Yes.
T: Why?
S: If you get money, they should ask that.
T: Why?

S: They're giving you money. Let's say they have a Honda and they want to go get a Mercedes just cause they want a Mercedes. They should ask.
T: What do you think, Gerome?
S: Same thing might happen—they might crash. They gotta know how you took care of the car.
T: Is it appropriate to ask if the person had a loan to buy a car before?
S: Yeah, cause that's when you're trying to figure out if they're trying to burn you.
T: Should the information about the two cars Ms. Austin had in high school being wrecked influence the loan? It did in your case, didn't it?
S: Um hmmm….
T: Do you think Ms. Austin handles money wisely?
S: She's single and has an apartment and buys clothes and stuff.
T: We're going to have to shut this down for now—you can finish tomorrow.

Even though the students show no sign of reaching a better understanding of the flaw in their decision, the teacher remained very patient and tried to lead them to understand what happened. Unfortunately, when the students finished the scenario the next day, there was no further discussion of this. It is this kind of conversation, which lasted less than eight minutes, that will help the students grow intellectually.

Table 5.3 Selected Interactions at King
Incident: (3) A student says, "It says 'Pay to the Order of Cash.' Can you do that?" The teacher does something to indicate that you can. *Interpretation*: The students express a reasonable concern in evaluating the banking transaction. However there is no information in the system that can provide the answer and it is not a matter of logical inference. Therefore, we see this as an instance where it is reasonable for the teacher to provide a direct answer to the question.
Incident: (11) One student comments, "They don't say how old she is." The teacher responds by asking if they looked at her ID. One of the other students in the group says, "I say she's about 22". *Interpretation*: The teacher offered an option for finding out how old the person is. This seems appropriate—she doesn't ask why they want to know or tell them that they don't need to know this. She tries to let them figure it out for themselves. She chooses not to persist when the students ignore her suggestion.

EBC High School. The teacher at EBC displays elements of all three models for coaching. The main examples of an inquiry- or learner-centered strategy can be found in the lead-in and follow-up discussions with the whole class. Following is an example of the nature of the conversation at the end of the third scenario. The students speaking are the group we watched in the morning class.

> When the group finishes, they cover up their monitor with a sheet of paper because they are embarrassed about getting the wrong answer. The teacher asks (as part of whole class discussion) "What happened?"
>
> The students say, "We got fired" and "We had to go to court."
>
> The teacher continues, asking, "Where did you go wrong?" The students say that they should have had the customer sign the check in front of them. One group member mentions that this never happens to him in real life—they just look at his ATM card. The teacher asks what the student thinks they want the ATM card for.
>
> He says, "to check the account." The teacher points out that it has a signature and is a form of ID. Then she asks class to explain what might have gone wrong with this scenario.

This is a common kind of conversation in the large class discussions following each activity. The teacher obviously wants all the students to think about what they are doing and provides a discussion that pushes the students.

This teacher, however, is almost absent from the video when the groups are working on *Chelsea*. Occasionally, we see her walking around and glancing at the work the students are doing. Unfortunately, in some circumstances, the teacher's unwillingness to coach or help the students can actually be an inhibitor. One instance in particular stands out:

> The students call the teacher over and say, "None of the answers make sense" and then explain what they mean.
>
> The teacher says, "What do you think you should do?" The students say that the check is payable to "Cash" and they think that's wrong. They explain that they think a check cannot be made out to cash because a check needs to be written out to a person.
>
> Then, the teacher asks, "What's cash? What's the definition of cash?" The students try to look it up in the glossary, but it isn't there.
>
> One of the students offers, "Cash is money."
>
> The teacher responds, "What's money? Think about it...." and walks away.

In this case, the students were stuck on an issue that should not have become a major concern of solving the problem. The teacher was trying to promote inquiry and help guide the students to new knowledge, but instead left them frustrated and confused. This seems to be a potential problem for any teacher learning how to facilitate problem-based learning situations. They must learn to discern between opportunities to foster growth and getting in the way of learning.

Table 5.4 Selected Interactions at EBC High School

Incident:

(3.2) The students say they are done and tell the teacher that "That's 2 satisfied customers in a row." The teacher asks what happened with the first one. The students say they got it right too, but she missed her brother's wedding, so the customer wasn't happy.

Interpretation

The teacher expects the students to remember what they've done—that seems good. The teacher is not expecting much beyond just memorization of events.

Incident:

(11.1) This tape starts out with a long whole-class discussion introducing the ideas for getting loans. The teacher asks things as if the students were going to do it in real life. For example: "What if you were going to get a loan?" A little while into the conversation, the teacher notices that people in one part of the room are not paying attention; she starts specifically calling on them instead of other class members. The group we are watching quickly loses interest in the conversation and starts talking about other things.

Interpretation:

She is starting by preteaching for the scenario that completes this activity. Because the teacher is focusing on getting a certain part of the class to participate, she excludes some students, such as the ones in the group we see. They quickly lose interest. (It also appears that they already know the information being covered which may also have lowered their engagement level.) The students become engaged once they begin work on the scenario.

Jefferson High School. Jefferson High School provided an unusual circumstance. The regular classroom teacher is not involved in the simulation. The person who acts as the teacher does a good job of trying to ask good questions and aid the students in learning. However, he never gets into the questions that would really make the students think, such as "Why?" He tends to ask the students to summarize what they have done. For instance, in the third scenario, the first group finished and the teacher asked what the problem was in this scenario.

> One student explains that someone brought in a check form a different branch, and they had to decide whether or not to cash it. The teacher then offers, "you just needed a signature card?" The students tell him that they needed two IDs. Then the teacher asks if the customer was a friend.
>
> The students say "No, but the customer was well-dressed." The teacher laughs and thanks them. This is a fairly typical follow-up dialogue at this school. While it confirms that the students did complete the scenario, it does not push them to reflect on what they decided.

The teacher's questions also suggest that he is not very familiar with the scenarios. However, he does not seek to learn from the students but simply drops the query.

The strictly hands-off approach used in this situation does allow the students to develop their own ideas about how to solve problems. However, the students never get any guidance to help them understand where their plans need to be enhanced.

Table 5.5 Selected Interactions at Jefferson High School
Incident: (3.2) The students are discussing their inability to get information on the customer. The teacher explains that the credit check is for loans and this customer has an account so they need to check "accounts." The students type the name again, and the teacher, again, says they need the accounts page. The students say they tried that, then mention that they cannot read the customer signature well enough to spell the name. The teacher has them back out of the screen and shows them that the customer's name appears in print on the check. They go to accounts. The teacher points out that savings accounts are on one side and checking is on the other. Then he asks if the students are sure of the procedures and suggests that they "might want to check them." *Interpretation*: This is a case of teacher as information. He was watching and realized that the students were stuck (they looked frustrated and weren't sure what to try next). Rather than asking questions or modeling problem solving, he simply offered suggestions as to what they should do. While he was trying to be helpful, he gave them solutions rather than the solution-finding process. There is another question here: "Why is it that in the third scenario the students still don't know that on the screen one side is checking and the other is savings?"
Incident: (3.2) The students ask how they can ask the customer for identification. The teacher says they'll have to go on to the decision area in order to do that because that's where that is pertinent. He also mentions to read all the decision options before picking one. *Interpretation*: The teacher actually helps the students work outside of the authentic problem—suggesting they look to the solutions to see what information is needed. Yikes!
Incident: (8.1) The teacher discusses why the students made the right choice: All they needed was a signature card because the bank account was at *Chelsea*. He says "Good Job" and asks if they need anything else. Then says, "Thanks." *Interpretation*: This could have been an opportunity for the students to express why they chose the correct answer, but the teacher instead stepped aside and let the students go.

Incident:

(8.2) The students are puzzled because they think C is the right answer except that the last sentence is rude (telling the customer that he needs a bath). The teacher says that they need to make a judgment because they have "to accept the whole answer, not just part of it."

The student says that its about the ID that the guy doesn't have, but they can't tell him he stinks. Again, the teacher says that they will need to use their judgment: "You can't choose a part." The students ask once more. The teacher says, "Choose the one that is most correct."

> Interpretation:
>
> This illustrates how providing decision options in *Chelsea Bank* disrupted—invalidated—the students' problem-solving process. To deal with this, the teacher would have had to step outside of the *Chelsea Bank* framework and let the children formulate their own answer—and then have them compare it to what *Chelsea* said. However, he clearly did not feel comfortable assuming that role and chose instead to make it an academic decision (choose the whole answer) rather than promoting a real problem-solving decision.

Incident:

(8.2) Teacher says, "Remember, I told you to read the whole thing."

The students discuss their choice. One says, "See, I told you."

The teacher says to read the other consequences. The students are puzzled by the correct answer. One says that thinking you're going to faint is just as bad as saying to take a bath. The teacher points out that "you think that, not say it." Then he turns to the problem and asks if the problem was with the check. The students say it was with the ID. The teacher asks what bank the check was form. They say it was written to the guy.

The teacher says, "Did you check the account?" and "Did it have money?"

(Students say "yeah.")

The teacher says the check was from *Chelsea* so they didn't need ID.

The students respond, "So we get fired, or quit—that's not fair because the first [correct answer] was rude too."

T: But you thought that. Do you see the difference?
S: He didn't have any [ID].
T: Did you check his signature card?
S: Yeah.
T: It was his signature and he signed it in front of you?
S: Try to say what rule book said.
Then the teacher tries an example from "real life" explaining what would happen if you go into a bank like this. One of the students says, "Oh yeah, my mom does that and she doesn't have ID."

> Interpretation:
>
> The teacher is definitely trying to promote inquiry here. He is trying to explain, without dictating or directing, why the answer is incorrect. He uses a few different approaches to help the students see why their answer was incorrect.

Salesian High School. The teacher at Salesian was easily the most director-like of any of our teachers. He consistently acted as an information provider. In fact, almost every instance of interaction with the students involved him telling them what to do next. This teacher is also the only one who specifically assigns tasks to the students. Each student has a particular "job" within the group—one types on the simulation computer, one types the rules on another computer, and the third is best termed the "information manager."

In one typical instance, the teacher has a step-by-step procedure for his students to follow and refers to it occasionally when they ask him questions. For instance, in scenario 3, the students ask him if the page of the manual they are looking at is the correct page.

> Mr. Zacc responds by saying, "It says page 8 and 9. Go to page 9." He continues, pointing out that "Step 2 is to obtain proper ID." Then he says they need to check page 8 if they don't know what that means. Then the students ask if the steps listed are the steps for cashing the check. Mr. Zacc says, "Yes" and proceeds to explain each of the rules to the students. When he walks away, the kids start typing the rules, word for word, into the log that they are required to keep. In this situation, Mr. Zacc first told them exactly where to look for information, thereby preventing them from developing their own process. Then he immediately started explaining what was written in the manual. This furthers the relationship that is clearly set-up in the classroom where the teacher is the holder of knowledge and the students are dependent on him to dispense that knowledge.

In an example from the 11th scenario, Mr. Zacc shows no sign of progress from the mindset in scenario 3. The students call him over because they do not know how to fill out part of the loan application.

> Mr. Zacc immediately tells them they cannot do that part of the loan application from the screen they are on. When the students ask why, he points out that the information they need is from the credit check screen and they are in the account information. Then he says, "This information has to come from the computer. Remember, I showed you the steps? When you get to that step, you fill out this information." This final statement confirms that he has not allowed the students to create their own problem-solving model. Furthermore, when the students asked "Why?" Mr. Zacc was given an opportunity to help them think through the situation to arrive at the answer. Instead he just gave them the answer.

Mr. Zacc's class is interesting in some good ways as well. Because the video often ran over into the part of class immediately following work on the scenarios, we were able to hear the large group follow-up discussion and the assignments he gave based on the *Chelsea Bank* scenarios. The assignments were writing assignments based around reflection on the scenarios. For instance, the assignment after scenario 8 made the students consider the following questions:

- Have you ever been treated rudely? How did it make you feel?

- Do you think there are circumstances where it should be allowed to turn away Mr. Smith? Where? When?
- When working at a job, do you have the right to act on your own opinions of customers? Why or why not?
- Do you think your attitude toward and treatment of customers can effect your business?

These questions all provide some opportunity for the students to reflect upon the *Chelsea Bank* activity.

Table 5.6 Selected Interactions at Salesian

Incident:

(3) The teacher walks by and notices the students typing account information. He says they have to figure out what the transaction is, then asks them what it is. They reply, "Cashing a check." Mr. Zacc then tells them to read the manual first, then look at the account information because they can't know what's important without checking the manual.

> *Interpretation*:
>
> This is definitely a case of teacher as information provider. Mr. Zacc has laid out a specific order in which the activity should take place. He discounts that there can be any way for the students to have any ideas without consulting the manual.

Incident:

(3) A student asks, "Mr. Zacc, how do you spell her name?" He spells it as he walks by. He gets almost past and backs up. Says, "You're in credit check" and points out that there are two things to check. He says they need to look at accounts. Student mentions that they've checked three times. As he walks away, they ask him how to spell her name again. He looks at the machine they are taking notes on and points out that they have it.

> *Interpretation*:
>
> Not surprisingly, in cases where the teacher provides all the answers, the students start becoming quite dependent on the teacher. By telling them they were in the wrong section, Mr. Zacc saved them a lot of time, but there is no clear evidence that they really understood why they were in the wrong place.

Incident:

(3) Student asks, "Does she have to sign again?" Mr. Zacc says that its confusing because they don't know if she signed it there or elsewhere. They say her signature matched. He says good, then asks if the quietest group member agrees. (Everyone in group says yes.)

Interpretation:

This is a good question and an appropriate answer. Mr. Zacc tries to explain the shortcoming of the program to the students rather than merely giving them a yes or no answer. This seems to help build more understanding than just saying "yes" or "no." This is a case where being an information provider may have been the best option.

Incident:

(11) Mr. Zacc walks by and looks at the loan application form students are filling out. He says, "to fill this out right, you have to have something up here" [points] "because this is so long, you need to do [unintelligible]"

Interpretation:

Here Mr. Zacc is definitely an information provider—almost an information dictator. The kids didn't ask for his help; they seemed to be doing their work fine but he came over and told them what to do next and how to do certain things.

Incident:

(11) A student asks, "What do you put for bank?" Mr. Z points out how to read the credit report. One item is a credit union. Students ask what this is. Mr. Z says it like an employees bank. Mr. Z says they have to check everything out to see if the credit is good—"Is there a history of bouncing checks? Does the person have savings?" Then he has to show students again how to read the report. They are trying to use Chelsea Credit Union as a bank name (its ABC Credit Union, but they couldn't read it all, so rather than scroll, they assume *Chelsea* is also the name of the credit union)

Interpretation:

In this case Mr. Zacc is again providing all the information. He teaches them how to read the credit report and gives them the answers for the sheet in the process.

Incident:

(11) The students are reading the screen as the teacher walks past. They turn around as he goes by and ask "Is this what we need to do for you? Get one of these?" Mr. Zacc says they have to find the customer service rule that applies to today's lesson.

Interpretation:

Mr. Zacc's actions were desirable. He was just looking around to see what the groups were doing. However, because there is a strong case of student dependance on the teacher, the students feel compelled to ask questions that, again, they should know the answers to from past examples.

Lessons Learned. The teachers at all four schools seem to want *Chelsea Bank* to be meaningful to the students. Yet it is clear that they cannot yet facilitate a learning environment of this kind. There is little student-teacher interaction at all during these scenarios. When there is interaction, it is typically student-initiated and generally involves a question that the student could have answered for him or herself with some guidance. The dominant teacher responses to the students when they ask questions are directing responses. Often the teacher demands that the student go to the next step in a specified procedure. There is no discussion of why a certain step should come next or what the overall goal for the procedure is. The teachers do not ask the students what they had in mind for solving the problem.

One teacher showed a significant amount of change over time. She moved to a point of being learner centered, promoting inquiry and critical thinking. Other than that, there was little growth across the three scenarios. The overall message here is that teachers can learn to be guides. They can be successful at asking questions that promote thinking and promoting students to think for themselves. However, they do not do this on their own. Some sort of training needs to be provided to help them understand how to become a guide rather than an information giver.

Finally, after watching and analyzing these tapes, it becomes apparent that it does not take much longer to promote inquiry than to provide information. Most of the student-teacher interactions are very short regardless of the approach used. It is obvious that the teachers need more support in adopting the "promoting inquiry" model, but once they become proficient at it, the level of discussion in the classes will rise with little extra effort.

VI. Four Key Issues that Cut Across the Analyses

The various aspects of the year-one study revealed several issues that cut across all of the analyses that were conducted. Thus these issues were observed from different perspectives and appeared important in understanding the behaviors of students and teachers using the program. This suggests that these issues will be important considerations in the development of assessments and teacher-support materials for the *Chelsea Bank* program.

Four issues are presented here in brief form, for much has been said about each of them throughout the report:

Teacher behavior makes a difference in student behavior.

This issue was very obvious both to the researchers analyzing the program from the perspective of the SCANS competencies and to those analyzing the tapes to rate teacher and student behavior on major emphases and as problem-solving strategies. When the teacher was present, the students were noticeably dependent on him or her for guidance. Sometimes the teacher asked questions that were intended to help the students become more independent problem solvers; many other times the questions focused on how the consideration of the scenario's problem should proceed and be completed. Much teacher guidance tended to focus on how to use the thinking/review tools built into the program.

While students' focus on the problem scenario was more obvious when the teacher was present, their progress was slowed by a seeming need to seek approval from the teacher; and there tended to be less collaborative effort among them.

Yet it was clear from the study of the videotapes, from interviews with the teacher, from discussion with them in case studies, and from other classroom observations—that the teachers using the program have faith in and a variety of expectations for the program. (See the last issue discussed here.) The teacher's role, it seemed, varied as well, depending, in significant degree, on his or her teaching style and degree of enthusiasm for the activity. Thus the teacher appeared crucial in developing problem-solving behaviors, collaboration, and the basic skills applied in solving the *Chelsea Bank* problems. It appeared that it was the teacher, as well—supported by the administration—who would determine whether what is learned from the *Chelsea Bank* experience is exported to other classes and whether links are made across the curriculum.

While solving realistic problems, students practice basic skills.

As the students partake in the *Chelsea Bank* activity, they are always using and developing their basic skills. They are constantly reading from the screen—both to each other and in order to synthesize for and with the members of the team. They write numerous responses and conclusions onto the screen as prompted by the program, and as they do this, they invariably act as each other's editor, paying heed to their language usage—discussing diction, phrasing, and mechanics, including spelling, capitalization, and punctuation.

Not only were the students communicating with the computer, but they were clearly learning how to listen to and relate their ideas and opinions to each other. The interpersonal skills necessary to explain and to persuade, and to take an occasional leadership role were often in play in the collaboration that the program promotes.

In many of the scenarios, students are using their math skills as well, for the problems presented rely on and refer to numbers. This was an objective frequently cited by teachers.

The students who use the *Chelsea Bank* program appear to become more adept at using the computer as their experience within the scenarios progresses. They appeared impressively comfortable reading the monitor and using the mouse and keyboard. This basic technological skill was directly connected to using the reference/information tools and thinking guides built into the program, and these in turn relate to basic banking concepts that the students appear to learn easily.

A key problem-solving strategy that is developed by the program is getting and maintaining a focus on a problem. The problems are depicted by the scenario presented on the computer, and they usually maintain the focus necessary to move toward a solution. The students appear to learn the procedures for understanding and acting within the scenarios quite readily. They learn to use the tools and resources provided within the program. This ability to focus is not nearly all there is to problem solving according to most definitions, however, and the results of the study indicate that while the students use some of the eight problem-solving strategies identified for observation, they rarely use some that could be effective. Also, there is not much creativity in their solution seeking and problem solving. Overall, however, it appears that the *Chelsea* experience can help students learn to focus on and deal with problems that they encounter in the real world.

The students using the *Chelsea Bank* program were able to work together.

Across the videotapes—and especially in their teachers' absence—the students using the program appear clearly able to collaborate while deciding on solutions to the problems presented to them at *Chelsea Bank*. Much of the collaboration comes about through what might be called "mutual verbalization/visualization." They sometimes review briefly what they know about the problem, the customer involved, and the options presented for a solution.

Students read together from the computer monitor, supportively correcting any misreadings; they assist each other in true team fashion while entering responses into the program, adding words, revising diction, and nodding in approval or shaking their heads in disapproval. Seldom do teams discuss input before the entering of it begins, but there is more in-process revision than most researchers have noticed in student expression, in general.

Much of the best discussion seems to occur at the point in dealing with the scenario problem where the students are entering the consequences. This generates discussion and thinking, although it does not seem structured to promote revision in the decision already selected. As one boy reminded his teammates: They had already approved a loan, so it was not to be affected by what they decided the consequences were. This part of the program seems somewhat unrealistic to the students; it appears a bit inane to some to think about the consequences in the standard format used to generate their response. Because of this, it is not clear whether the kind of collaboration generated would transfer and encourage collaboration in other parts of the students' school day.

The focus of the program is different for different teachers and students.

It is of significant interest that while most participants have very positive reactions to and expectations about the *Chelsea Bank* program, there were a myriad of objectives and goals expressed; and few of those were clear-cut across the teachers and students we watched and interviewed.

The program effect most often noted by teachers was that it builds a tendency toward collaboration and effective teamwork. This is ironic, perhaps, since teacher presence did not often promote collaboration. Students, too, noted that the experience requires teamwork—but not always as a means of endorsing it. Still, the student who is regretting the need to collaborate with two fellow students is indeed being encouraged to do that, and most teachers feel it is a behavior truly worth developing.

Some teachers felt that the program's goal should be expressed in terms of its content—the math applied in understanding and dealing with the problems and/or the banking concepts learned. Several teachers expressed this by advising that assessment be in the form of a test to cover details that could be learned. Still others, were more interested in the processing of problems or, like some of their students, the application of basic skills. These teachers seemed to be acknowledging the need for a performance assessment.

As with the appreciation of the collaboration required, many teachers also noted the value of developing their students as problem solvers—some of these with a distinct appreciation for the students' experience in the particular (banking) arena, others eager to develop the process.

Overall, however, there was no clearly articulated set of goals or objectives for the program—an observation that depicts quite clearly one of the objectives that can be set for the assessment component that will be developed: It must help teachers and students understand and target the goals of the program.

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